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THE POLYTECHNIC REVIEW AND MAGAZINE.

PREVENTION OF RAILWAY ACCIDENTS.

ON THE PREVENTION OF THE RECURRENCE OF RAILWAY ACCIDENTS BY THE ESTABLISHMENT OF ELECTRIC TELEGRAPHS AND THE USE OF SIGNAL FIRES.

THE last month has been fatally distinguished by several severe accidents on railways, particularly by one at Nottingham, where, from the collision of two trains during the fog, several lives have been sacrificed, in addition to severe injuries inflicted upon individuals. In consequence of the neglect that was exposed by this inquiry, the public attention has been strongly directed to the necessity of the Railway Companies adopting some more efficient means of counteracting those dangers which the weight of the engines travelling at so rapid a rate must cause; but though the press, with scarcely an exception, has been indefatigable in pointing out these evils, it is painfully evident, from the evidence, as detailed at the inquest, that no efforts have been made by the directors; instructions, it is true, are given to the servants, but with the continual change to which such extensive establishments must be exposed, very little reliance can be placed upon their attention to the elaborate code framed to meet every variety of accident. From the power which the crown begins even now to exert over these gigantic monopolies, we can alone hope for the adoption of those remedies which science could afford, and of which the directors on this line of railway are clearly not aware. The late accident was due entirely to the fog; it was proved no object could be seen beyond a few yards, and amidst the conflicting evidence, we can learn that the signal to stop was not heeded. Colonel Pasley examined the place where the accident occurred, and a letter has been published from that officer, attaching blame to an engineer, Mr. Lightfoot, but had government, for this inquiry, as for that of the late colliery explosion, secured the assistance of Professor Faraday, more confidence would have been placed by the directors and the public in the suggestions made by one so distinguished as a chemist and as a philosopher, than by any officer, however skilled in mathematics and fortification. Had any chemist assisted at this painful inquiry, some explanation might have been given why the servants were not provided with the extremely ingenious and valuable signal light, the invention of Mr. Cowper, of King's College. The accident occurred through the impossibility of detecting through the fog the injured train; it will be seen that for such a case this invention is particularly adapted, and the experiments which were publicly made on the Great Western Railway, would, even in the absence of the high name of its inventor, free it from the supposition of being from its apparent impracticability unworthy of a trial. Mr. Cowper filled a glass globule with sulphuric acid, and surrounded it with a coating of chlorate of potash and sugar communicating to a small quantity of gunpowder; when by any violence this glass globule is crushed, the sulphuric acid, on coming into contact, instantaneously fires the chlorate of potash and sugar, and the flash and report of the powder is the signal immediately to stop. Of course it may be urged that amidst the roar of the steam no report could be distinguished, nor would the men, dazzled by the glowing fire of the furnace, be very likely to notice the flash. These objections could be met only as Mr. Cowper met them, by the production of facts—every precaution was taken to avoid even the slightest approach to collusion, the engineers and stokers were not forewarned, and the most rapid trains selected for the trials, and the result would indeed appear conclusive; wherever the signal light was laid down, the flash was distinctly seen and the report heard. When the experiments were first made, complaints were made by the engineers that they had been fired upon, and threats of legal proceedings were received from farmers adjoining that portion of the line where the experiments were tried, who observed that the tranquillity of the cattle, accustomed to the noise of the engine, was disturbed by sounds of a different character. These experiments clearly shewed that men accustomed to the working of the engine, are able to distinguish sounds; a power which the traveller stunned by the noise, and unable to hear the voice of his friend, is little able to give him credit for. Assuming a case exactly similar to that on the Nottingham line, the engine injured, and the fog so thick as to destroy all vision beyond a few yards, two good runners could within five minutes have placed a few of these on the line 1000 yards on each side of the train, and no accident could have occurred. The furnishing the guard and engineers with a few of these would have involved no expense, and we regret to find that all who gave evidence on the inquest appeared ignorant both of the existence of such an invention, and of its trials on the Great Western line. Even under the most unfavourable circumstances this signal light is most valuable; when the fast train is behind its time, passing at its most rapid rate, darkness being joined to fog, and in defiance of the cries of the men and the lights, stations are often missed, no such accident could occur: the darker the night, the more distinct is the flash always noticed; and at this the signal invariably to stop the steam could be turned to reverse the wheels. Indeed, even where there is the most perfect electric telegraphs, some such signal must be used, for though every one at the station may be aware of the stoppage on the line, the ordinary methods of signals are not during the fogs available to direct those on the engine, and the human voice is useless.

The jury on the late occasion abandoned fixing any penalty on the Company, by deodands, which from some legal informality were always evaded, but have found a verdict of manslaughter against the engineer and servant, and have recommended the adoption on all railway lines of the electric telegraph, and a few years will doubtless see this suggestion carried out: on the Blackwall Railway every train is started by the telegraph, and on no line has there been fewer accidents. All electric telegraphs, and nomen illis multitudo, depend upon the laws that electricity, motion, and magnetism being given,—the union of two always gives the third,—magnetism and motion give the electricity of Professor Wheatstone, and electricity and magnetism give motion to his index. Electricity and motion produce magnetism, and give rise to another system of telegraphs, which in another number we propose to explain by diagrams, and shew the relative merits of Professors Bain, Morse, and Wheatstone. To all electric telegraphs there exists this serious objection, the wire requires being insulated, therefore they are much exposed to injury; an idle person could at the moment when the telegraphic communications would be most required break the wire; in case of accident on the line, they could hardly indeed escape destruction, and the telegraphs would be at this most trying time unavailable, several hours would indeed be spent before the seat of injury was ascertained. Burying the wire in the earth for a short distance does not interfere with its action, but when for a long distance the damp acts upon it, and the electricity is conveyed away by the cross currents. This serious evil has been attempted to be combated by Professor Wheatstone, but hitherto without success; every kind of varnish, pitch, &c., has been tried, but through all the damp after a short time pierces. The high name the Professor bears is a guarantee that nothing which modern research has brought forward has been left untried; still so important is this subject that we trust efforts will still be made—we have indeed lately inspected one experiment by which we hope this result will be obtained, and also a connexion thus opened for communicating with the continent, by laying lines beneath the surface of the sea. The expense at the present moment for ordinary telegraphs is between 3000*l.* and 4000*l.* per year, and the great misfortune is, that, notwithstanding this expense, there are no means of using them during nights, or in weather the slightest degree foggy. This is a most serious evil, indeed so fatal was it at first deemed, that various experiments were made by passing lights through red, yellow, and blue glasses, to establish some communication, but at a distance of a few miles the lights so completely blended as to render it useless. Signal fires were found very objectionable, every accidental fire gives an alarm, and after having been several times roused without cause, the watchmen are apt to overlook the real signal fires; but in foggy nights these would not be seen beyond a few thousand yards. This was, during the last war, much felt, and should any such calamity now happen, the power the French Government will possess of landing, by powerful steamers, troops simultaneously on different points of our coast, will render this a subject of national importance. Electric telegraphs are open to very great improvements; in addition to effectually securing the wires from injury, some increase of power would appear very desirable; the weight of a large fly would at present be nearly sufficient to stop them. Though for political purposes they are invaluable, we fear that their adoption would not alone secure us from collisions. One of the greatest advantages which will be secured by the general adoption of the Atmospheric Railway is, that the fearful calamities with which the columns of our newspapers have so lately abounded, cannot by any possibility occur.

ON THE NATURE OF PYROGEN[a] (THE ELECTRIC FLUID) AND CAUSES OF COMBUSTION.

By John Joseph Lake.

Electricity has been described as "the name of an unknown natural *power*, which produces a great variety of peculiar and surprising phenomena." But there is very good ground for supposing that it is something more than a mere power.

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[a] The term *Pyrogen* is here applied to the electric fluid, because there appears to be a degree of indefiniteness in the terms *electricity, electric fluid,* &c. And as it is hoped that sufficient evidence is produced in this memoir in support of its materiality and existence as a chemical body, it might be an advantage if this or some similar name was adopted. *Electrine* might have been used; but as the fluid has no more connexion with amber (ελεκτρον) than many other substances possessing like properties, I have chosen to propose an entire change of name; and as it bears the greatest resemblance to fire, and seems to have a most intimate connexion with that element, the word *Pyrogen* is submitted and here used.

It is by the mechanical effects of air, more than any thing, that we know it to be matter, or rather these are the plainest evidences of its materiality. In like manner we may infer that the electric fluid is matter, for it produces more extraordinary mechanical effects than air, and is, under certain circumstances, even visible to the naked eye.

It is a self-evident fact, or one, at least, confirmed by universal experience, that an immaterial body cannot produce mechanical effects upon matter. But the electric fluid does so; for instance, it will reduce the strongest oak to splinters, and some substances to powder; it has also frequently, in striking buildings, removed large blocks of stone out of their places, drilled holes in metal vessels, and produced earthquakes. These are not the result of the operation of an immaterial power. The like is not produced by gravitation, which is such a power or principle; neither can any thing that is not material produce the expansion that is felt on passing a pyrogenic shock through any part of the body.

I was led to deduce this theory of the material nature of this element, and also that it enters into the composition of many natural substances, and is evolved on their decomposition, or formed on or during their transformation, by making the following experiment. Taking a common half-pint tumbler, and using every precaution by cleaning it well to insure the insulation of its contents, I put into it a small galvanic arrangement, consisting of a plate of zinc, 2 in. by 4, with double coppers. On completing the circuit by wires in the usual manner, and insulating them also, and pouring in the acid solution, the galvanometer indicated an electric current.

The insulation of the contents of the glass and the wires completing the circuit being as perfect as it was possible to make it, the fluid developed could not have proceeded from without. Neither could it be a primitive substance *created* by the chemical action of the contents of the glass, but must have existed in them before the experiment, and been formed by a fresh combination of the released elements, unless it was one of the released elements themselves.

The water of the solution is decomposed in a galvanic arrangement like that under consideration during the action of the acid upon the zinc; the acid combines with the zinc, forming sulphate of zinc, but the copper is not affected.

Knowing that water is formed by the union of oxygen and hydrogen on the application of pyrogen (electricity), we at once arrive at the origin of it on the decomposition of water; for as it enters into its formation, when it is resolved into its elements the fluid must be released.

A difficulty arises here, because oxygen and hydrogen may be united, and water formed, by the application of a candle, or any light, as well as pyrogen. This renders it necessary to allude a little to the nature of combustion.

Combustion results from the union of gaseous bodies by means of pyrogen, for a mixture of oxygen and hydrogen explodes on the application of a pyrogenic or electric spark. Many other substances also ignite by friction, which produces pyrogenic excitation. On this principle the North American Indians, on the western coast, obtain fire by the rapid motion of a stick in a block of wood; and it will be invariably found that without the presence of pyrogen combustion does not take place. The light of a lamp or candle arises from a certain quantity of it being rendered visible on, and causing, the combustion or union of the hydrogen, that is produced from the decomposition of the oil or fat by the heat, and the oxygen of the atmosphere.

Every method adopted to obtain fire results from the operation of this principle; whether the common flint and steel, the American Indian method referred to, or the various improvements which modern chemists have made in the shape of lucifers, congreves, and the like. They all show the necessity of pyrogenic excitation to produce ignition which is obtained by friction.

The whiteness of the flame of a candle or lamp results from the carbon that is generated from the wick, for when the latter is not burnt the flame is blue, as may be perceived in a spirit lamp, in which, if a portion happens to protrude into the flame, it is consumed, and the flame is invariably white at that part. When pure hydrogen explodes, the flame is blue.

There is also strong evidence that pyrogen is an essential and active agent in combustion, in the fact that fires and candles burn very dull in damp weather, at which time there is much less of it in the atmosphere than in dry frosty weather, when fires and lights burn with much greater brilliancy than common. The only other causes that could by possibility produce this effect, are the presence of a more than ordinary quantity of oxygen in the air, or the moisture in damp weather decreases the brilliancy of combustion. As to the first, it is a well established fact that the oxygen and nitrogen of which the air is constituted are always in the same proportions, whether on the tops of mountains or the depths of valleys, at the equator or in the northern regions, in summer or in winter, so that there cannot be at any time a superabundance of oxygen to produce this effect, and any chance quantity of it in an uncombined state that might be floating about could not produce a general effect. The only way in which oxygen causes a fire to burn brighter at one time than another, is by applying a blast or current of air, by which means more air is decomposed and oxygen consumed in a given time. With respect to the second supposed cause, fires burn dull in damp weather in houses and rooms where it would be impossible for a quantity of moisture sufficient to produce such an effect to exist, on account of the warmth that prevails in them drying the air.

This view of the nature and causes of combustion and flame, clears up the difficulty above referred to; for if pyrogen is developed in the formation of flame, the application of it in that shape to a combustible mixture is the same thing as applying a spark.

The proofs in support of this theory of combustion are far from exhausted. The ingenious experiments of Messrs. Pollock, Gaun, and Mackrell on the ignition of metals in acid solutions [a] go far to establish it. I propose to follow these experiments seriatim.

The acid solution used by these gentlemen to pass the pyrogenic current through, was composed of 1 part sulphuric acid and 10 parts distilled water, in a common drinking glass that held about a pint.

Experiment 1. Fine iron wires (No. 26) were attached to the terminal wires of the battery. That connected with the positive was first immersed in the solution, and the circuit was completed by the immersion of the negative wire. The latter burnt with a beautiful reddish flame. This would seem to result from the following cause. Hydrogen and pyrogen being released at the negative pole on the decomposition of the water, and the oxygen of the acid having a greater affinity for these than for sulphur, the acid is decomposed, the sulphur is deposited on the negative electrode [b], and the released gas combining with the hydrogen and pyrogen, combustion takes place[a]. When the experiment is reversed and the negative wire first brought into the solution, the circuit being completed by the positive, the latter became red hot to the extent of an inch and a half under the solution. This resulted from the accumulation, as it is called, at the poles of the unconnected pile, rendering the pyrogenic current more powerful when contact is first made than at any time during its continuation. No flame appeared at the positive pole, there being no hydrogen present, all that obtained having escaped at the negative electrode.

Experiment 2. A platinum plate an inch long by half an inch wide being attached to the negative wire, and a small iron wire at the positive, the platinum being first immersed in the solution, and the circuit completed by the positive wire, it became red hot an inch and a half under the solution, as in the last experiment, and from the same cause; but when it was only brought into contact with the surface of the solution it fused, which was prevented when it was immersed.

Experiment 3. When the iron wire was placed at the negative end of the battery and the platinum at the positive, the platinum being first put into the solution and the circuit completed by the iron wire, the latter burnt with a red flame. This resulted from both oxygen and hydrogen being present at the negative pole, as in the first experiment.

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[a] Proceedings of the London Electrical Society, 1841-2, p. 6.

[b] Polytech. Rev., April, 1844, p. 227, and Electrical Magazine.

Experiment 4. A fine copper wire was attached to the positive terminal, and a platinum plate to the negative. The platinum being as usual first immersed, and the circuit completed by the insertion of the copper wire, the latter was heated an inch under the water. The cause of there being no flame is the same as in the former experiments, for the copper wire being at the positive electrode, no hydrogen was present to produce it. But when the experiment was reversed, and the copper wire placed at the negative termination and the platinum at the positive, the latter being first immersed and the circuit completed by the former, the copper or negative wire burned with a bluish flame, oxygen and hydrogen being, as before, present at that pole.

Experiment 5. A slip of zinc was used instead of the copper wire, and with the same results; for when placed at the positive termination, and the platinum at the negative, and the latter being first immersed in the solution, the zinc was heated an inch below the surface of the liquid, but when the zinc was placed at the negative, the platinum at the positive, and the latter first immersed, the zinc at the negative burned with a purple flame, hydrogen being present, as before, at that pole.

Experiment 6. With platinum at the positive and sulphuret of antimony at the negative, the platinum being first immersed, the antimony or negative electrode fused or inflamed, depositing on the glass and surface of the solution an orange colored powder resembling Kermes' mineral. When the sulphuret was at the positive, the platinum at the negative, and the latter first immersed in the solution, white fumes were given off by the sulphuret, but it was not ignited, for, as in the preceding experiments, there was not any hydrogen at the positive pole.

Experiment 7. When an iron wire was fixed to the positive, and a charcoal point at the negative termination, the iron wire being first immersed, immediately the charcoal touched the solution it became very brilliant. But when the experiment was reversed this did not occur; for when charcoal was at the negative hydrogen was present, but not when at the positive.

Experiment 8 varies in its results from the preceding, in that both gases appear at the electrode last immersed, and neither at the electrode which first enters the solution; but as this phenomenon does not bear directly upon the subject under consideration, it will be unnecessary to enter upon an explanation of it in this place. Platinum plates of the size before stated were attached, one at the termination of each electrode. The negative being first plunged into the solution, the circuit was completed by the positive, when the latter became instantly heated, having a bluish flame round its edges, no gas being given off at the negative electrode. When the positive was first inserted into the solution, and the negative made to complete the circuit, no gas was given off at the positive, but frequent explosions took place at the negative. In the first case the positive became red-hot under the fluid; and in the latter, the negative in one instance.

Mr. Mackrell has since discovered that the same effects result if other acids than sulphuric are used [a].

In these experiments, the combustion of the gases could only have resulted from the presence of pyrogen, for there was no other agent present by which that could have been effected.

This memoir would be very imperfect if I passed over in silence some of the labours of others bearing upon the subject. When my theory of "the diffusion of the electric fluid" first appeared [b], I was ignorant of Mr. Sturgeon's experiments; but a friend has since drawn my attention to them. Mr. Sturgeon found by his experiments, that "every vertical column of a dry cloudless atmosphere, whatever may be its dimensions, is constantly electro-polar in one and the same direction, having its positive pole upwards." [c] He adds in a note,—"I have made more than five hundred experiments with kites for exploring the electricity of the atmosphere; and in every case where clouds do not interfere, I have found the upper strata positively electral with reference to those that are below. I have had three, and sometimes five, at different altitudes at the same time, and have transmitted sparks from one to another from the top to the bottom of the series; in every case I found the uppermost of a pair to be the positively electrized stratum of the atmosphere, so that if the strata in which the kites were immersed were at altitudes corresponding to the series 1, 2, 3, 4, 5, their relative electric states would be very conveniently represented by those numbers. The experiments were made at different seasons of the year, and in every part of day and night. When clouds interfere, the distribution of electricity natural to an unmolested atmosphere is often disturbed."

On the 6th of October last I witnessed an appearance of aurora borealis at Belfast, in perfect accordance with Mr. Sturgeon's experiments. I observed it first at half-past 8, P. M., when it had the appearance of a very bright bank of light. Its situation was due north. At 55 minutes after 8 a stratum of similar appearance had formed above this bank, and entirely distinct from it, forming an arch from east to west. From the lower stratum two brushes of light ascended, resembling enormous wheatsheafs in appearance. The western brush remained very steady; but the eastern, which was the largest, varied much in intensity, and pulsated greatly. During the time I was observing it, it once entirely disappeared, but as suddenly reappeared, and a brilliant ball of fire ascended in the midst of it with the rapidity of lightning, growing gradually paler until it became invisible in the upper stratum. At every pulsation the light evidently ascended from the lower towards the upper stratum, through which the brushes passed, ascending a short space above it, and gradually disappearing.

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[a] Proceedings of the London Electrical Society, 1837-40, p. 20.

[b] Polytechnic Rev., April, 1844, p. 227, and Electrical Magazine.

[c] Ib., May, 1844, p. 263.

In reference to Mr. Sturgeon's experiments, Mr. Pine says, in a letter to the secretary of the London Electrical Society,—"I now considered the fitness of plants, by their structure and properties, for receiving electricity from contiguous and surrounding bodies. Their solid parts are non-conductors, their fluids are conductors. . . . .

"The experiments of M. Cavallo, and, more recently and effectually, those of Mr. Sturgeon, had shown a constant positive electricity in the air, as distinguished from the effects of clouds. If the atmosphere is, as from experiments it appears to be, an immense magazine stored with electricity, and if, as observation teaches us, the whole vegetable creation puts forth into this magazine myriads of points, it would seem that in the event of these points being conductors, their action as such upon the surrounding and all-pervading electric matter would be intimately connected with the process of vegetation.

"Such reflections induced me to present the pointed extremity of a blade of grass to the prime conductor of my machine, when I was surprised, as well as delighted, to observe that the degree of its conducting energy, the brilliancy and constancy of the stream of light it received from the positive conductor, far exceeded any thing I had ever before observed. I found, too, that the vegetable point continued to be illuminated to a greater distance than I had ever before seen any point."[a]

In confirmation of Mr. Pine's observations may be observed the formation or development of carbonic acid by plants; for the electric fluid, or pyrogen, passing through them, would readily enter into combination with the carbon of the plants and oxygen of the air. For on passing a current of it from a charcoal point carbonic acid is obtained.

It has also been found that pyrogen is developed on grinding many vegetable and mineral substances in an ordinary coffee-mill; some of them being previously roasted. Amongst those experimented upon are coffee, corn, barley, rice, Turkish wheat, chestnuts, French beans, beans, lentils, vetches, grey peas, alum, bread, and millet unroasted; also sulphur, gunpowder, cream of tartar, gum arabic, sugar, marble, ochre, chalk, green lake, lime, loam, sulphate of copper, white lead, vermilion, umber, rock-alum, verdigris, sand, stone, ashes, common salt and bricks [a].

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[a] "On the electricity of the atmosphere, and its connexion with vegetation."—Proceedings of the London Electrical Society, 1841-2, part 1, p. 20.

The powders were dropped on the plate of a Volta's electroscope, and caused the divergence of the leaves, and produced sparks. The coffee-mill was large, and speedily ground the substances placed in it. Pyrogen or electricity was obtained in sufficient quantities to charge a Leyden jar and give shocks.

I have long since observed the production of pyrogen in grinding coffee, but concluded that it resulted from the friction of the process. I am now, however, led to doubt that fact. It is a point worthy of research and inquiry, and doubtless is one that will ere long be cleared up.

These various theories combined together, and supported, as they are, severally, by facts and experiments, form one great whole. My memoir alluded to, "On the Diffusion of the Electric Fluid," shews that it is urged, by its own inherent principle of repulsion, to the parts of the earth most remote from the centre, and it is proved by Mr. Sturgeon's experiments, that this repulsion is so great that the fluid actually rises into the atmosphere, and the aurora seen at Belfast seems to have been a visible case of this operation. Mr. Pine's theory shews that vegetable nature attracts and conducts the fluid, though he appears to consider they derive it from the air. According to my theory they may derive it also from the earth, and are mainly instrumental in conducting it thence into the atmosphere. The existence of it in the composition of water, proves that it is also a component part of a great portion of animal and vegetable substances, in the formation of which water is an essential ingredient. The only point in the above experiment that wants further investigation is the development of pyrogen on grinding various substances; for it remains yet to be shown, whether the pyrogen that resulted arose from the friction, or from the substances themselves, or both. But this deficiency does not affect the general theory: for when water enters into the composition of any substance, pyrogen must do the same, it being shown that it is a component part of that fluid.

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[a] Electricity obtained from several substances.—"Letters from Dr. Ferdinando Ellice, Professor of the Royal University, Genoa, to Constantino Dentone, and from M. Dentone."—Proceedings of London Elect. Soc. p. v. p. 228.

DR. CLANNY'S SAFETY LAMP FOR MINERS.

Dear Sir, — Agreeably to the tenor of your letter to me, dated the 10th of this month, I herewith have much pleasure in transmitting to you a few notes in respect to my humble endeavours to give a safety lamp for our pit men or coal miners, premising that I will keep within due bounds, and record nothing in malice.

Sir Humphrey Davy, in his work on his safety lamp, remarks, at page 7,—" M. de Humboldt, in 1796, conceived and executed the plan of a lamp for giving light in mines, where a common candle would not burn, or produce explosion; but it was founded on the principle of entire insulation from the air, and could burn only for a short time, till the air contained within it was exhausted." For my own part, I had never heard one word of this totally isolated light; in fact, the account, according to Sir H. Davy, made its appearance in a foreign periodical, entitled " Journal des Mines." Could any person presume to call this toy a safety lamp? Yet, Sir H. Davy brought it forward when he pirated two forms of my original safety lamp, and read his first paper upon the subject to the Royal Society, towards the conclusion of the year 1815.

The gist of this was well understood at that time by all persons who would or could think for themselves. Moreover, I called my original apparatus for affording a steady and safe light to our coal miners, a " Safety Lamp," and hence the continuance of the name given by the father of safety lamps to this day.

In the year 1812, I completed the construction of my original safety lamp; and in May, 1813, a paper, entitled "On a Steady Light in Coal Mines," by W. Reid Clanny, M.D., was read to the Royal Society; and soon afterwards published in the Philosophical Transactions.

Previous to the reading of the above mentioned paper, the safety lamp had been experimented upon by Dr. Woollaston, Mr. W. Allen, Mr. Pepys, and Professor Berzelius; all of whom were members of the Royal Society.

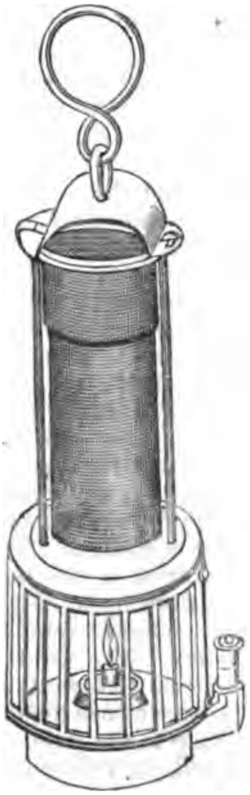
In this paper the following paragraph occurs:—

"I find it needful here to remark that, as far as applies to myself, the idea of insulating the light, and also the plan which I have adopted of carrying it into effect, by the construction of the apparatus or lamp, are perfectly original. I may also remark, that wherever a person can exist from a sufficiency of atmospherical air, this lamp will afford a safe and abundant light, from one candle only, for the space of five hours at least."

In the Report drawn up by the Select Committee appointed to inquire into the nature and extent of those lamentable catastrophes which have occurred in the mines of Great Britain, A.D., 1835, we find the following words, as respects myself:— "The principles of its construction appear to have been practically known to Dr. Clanny," &c. And at page 28 of the minutes of evidence in the said Report, the following words may be read—being part of my evidence before the said Committee: "I had given a safety lamp to the public, and it had been tried in one hundred acres of inflammable air, at the exploding point, before Sir H. Davy gave any safety lamp to the community."

The following words may be read at page 11 of the admirable Report of the South Shields Committee for investigating the Causes of Accidents in Coal Mines:—"Dr. Clanny, in this country, appears to have been the first man of science that conceived it possible to enter into a contest with this destructive element, (fire damp,) and, sustained by his unwearied philanthropy, has never ceased, for thirty years, to devote his talents and exertions to mitigate the horrors consequent upon its explosions."

From the year 1812 up to the period of the introduction by myself of my original safety lamp into a very fiery mine, (the Harrington Mill Pit, six miles distant from Sunderland,) upon the 16th of October and 20th of November, 1815, I had been visited by many gentlemen concerned in coal mining, and also by men of science, including Sir H. Davy, Dr. Hamil, long the chief philosopher of the Emperor of Russia, (my intimate friend,) and R. Bald, Esq., F. R. S. E., who at that period made in the first instance known to me, the augmentation of heat as we descend into the bowels of the earth. These gentlemen not only carefully examined, but also experimented with the original safety lamp.



We ought not to be surprised that persons engaged in colliery operations were timid in respect to the carrying a light into coal mines known to be infested with fire-damp, and hence the difficulty of obtaining consent for such trials, even when I volunteered to face every danger; and had I not been the first to face the danger in 1815, I have every reason to be satisfied that such trial would never have been carried into effect in our coal mines. Hence the confidence which all projectors of safety lamps displayed from that time to the present.

It is a subject of felicitation to me, that all of the six safety lamps which I have freely given to the public during the long period of thirty years, have been, in all respects, truly safety lamps, for not the slightest accident has at any time taken place in using any of them, even in some of our most fiery mines. The construction of my newest safety lamp is exceedingly simple, whilst the light afforded by one of them is equal to that afforded by five or six common wire gauze lamps, as has been proved by competent experimenters. The nature of the gases which are admitted to the flame of this safety lamp may at once be understood by simple inspection.

It may not perhaps be irrelevant to mention, that the South Shields Committee, in their interesting and valuable "Report," conclude their remarks on my newest safety lamp in the following words:—"In principle and operation it is infinitely superior to any the Committee has yet examined."

Dr. D. Boswell Reid, F.R.S.E., in his "Illustrations of the Theory and Practice of Ventilation," is pleased thus to express himself on behalf of my new safety lamp:—"On the whole, I may add, that the lamp introduced by Dr. Clanny, (who had the merit of constructing a lamp with which the miners entered safely into explosive atmospheres, before any other person in this country had directed any attention to this subject,) is the most important I have hitherto seen. Dr. Clanny preserves the flame upright at all times, by a strong cylinder of glass, which enables the flame to give more light than that which can be obtained from the safety lamp of Davy. It is defended by a guard, and I have plunged it into water, without fracture, after using it for an hour in one of the deepest mines in this country. It was not blown out by a current that rendered the Davy lamp comparatively useless as a source of light. In mines, the introduction of larger supplies of air, shorter air courses, the use of a lamp on the principles recommended by Dr. Clanny, the education of the miners, and the use of a carbonometer, appear to constitute the more important points that demand attention."

I take leave to give a few observations which were made at a monthly meeting of the Literary and Philosophical Society of Newcastle upon Tyne, a few months ago, by my excellent friend Dr. Mortimer Glover, Lecturer on Chemistry to the Newcastle Medical School, as published in the newspapers of the day:—

"Dr. Glover gave the preference, in every respect, to the latest lamp of Dr. Clanny. In this safety lamp the air is admitted by a wire gauze cylinder, through which the products of combustion also escape. The flame is encircled first by a tube of mica, and then by one of thick glass, which latter is protected by a brass cage. The great principle of this lamp is, that the admission of air to the flame is wholly from above. By this means the influence of currents acting laterally is in a great measure prevented, and the light being transmitted through glass, the wire gauze may be made of that degree of fineness which will insure its safety."

This is quite in point, for the wire gauze cylinder of this new safety lamp contains five hundred and twelve more apertures in the square inch than any other safety lamp heretofore known to the community.

I remain, dear Sir, yours very truly,
W. REID CLANNY,
M.D., F.R.S.E., Hon. M.R.I.A.

14th December, 1844.

We have great pleasure in inserting a letter addressed to us by Clanny, and which was forwarded to us in consequence of a correspondence that arose out of the article on the Safety Lamp, that appeared in our last number, and has both attracted considerable attention and elicited much discussion. The reputation of Dr. Clanny is so universally acknowledged, that we feel that we cannot, in justice to the public as well as to himself, decline giving him the opportunity of asserting his claims to the invention of the Safety Lamp. The approbation of all who have inquired into the subject he richly merits. The medal bestowed upon him by the Royal Society of Arts is a proof that his endeavours have been estimated; and we have reason to know that the Safety Lamps of Dr. Reid Clanny are in the possession of their Majesties the King of the French, the King of the Belgians, the King of Prussia, the King of Saxony, and the King of Denmark, and it is worthy remark that they are Royal Coal Mine Proprietors.

PROGRESS OF RAILWAYS.—THE ATMOSPHERIC RAILWAY.

Weale's Quarterly Papers on Engineering. Part V. 1844.
Weale, High Holborn.

The increase of means for intercommunication between distant places, both as regards passengers and goods, is now admitted to be a matter of primary importance as an element in civilization and social improvement, not only in this country but upon the continent. In this country, judging from the long string of notices for bills for railways about to be applied for, the subject must necessarily engross a large portion of the attention of the legislature during the approaching Session of Parliament. The public are more nearly interested in the result of these projects than they would at first imagine, and they would do well to pay a little attention from time to time to the principles upon which they are conducted, and the prospects which they hold out.

Some few years ago, when the existing great lines of railways obtained their bills, all of them after contests more or less severe and expensive, the public, foreseeing the necessary interruption of their accustomed modes of travelling which would follow, were apt to overrate the monopoly which would be put in the hands of the proprietors of the new system; and much anxiety was expressed from time to time as to the discretion and moderation with which the latter would act with regard to their customers. For a time also the directors, secure as they fancied in their undivided authority, acted with a high hand, and charged a rate of fares which, though much lower than the coach fares under the old system, were still much too high. Since then they have begun to find out their error, and have reduced their fares, some of them to nearly the extent of 30 per cent. But still experience, and the force of some well ascertained facts as to the actual current expense of the traffic, proves that, reduced as they have been, the fares upon all the railways are much too high, both as regards the public interests and the interests of the proprietors in a commercial point of view.

Facts are stubborn things. Now with respect to fares:—in rough figures the prevailing rate of fares on the principal railways may be stated to be a little over threepence per mile for first class passengers, and from twopence to twopence farthing per mile for second class passengers. Third class passengers were conveyed at about one penny farthing a mile, but in such wretched exposed trucks that only in the finest weather was the conveyance tolerable to a human creature. Recently an Act of Parliament has come into operation, by which the various railway companies are bound to start one train a day of covered carriages for passengers, who shall be charged at the rate of one penny per mile. We will not at present enter into the complaints which we have heard from all parts as to the spirit in which this regulation has been carried into operation by the various companies. The delays and annoyances, to say nothing of graver matters, which have been charged against them by the unhappy passengers by these abominable trains. It is evident that the railway proprietors consider the penny-a-mile trains a grievance to themselves, and a severe sacrifice which they are compelled to make to the public convenience, and they wish to discourage the use of them as much as possible. Yet how does this view of the case agree with the fact that most of the principal lines of railways, including the Brighton, the South Eastern, the South Western, and the Great Western, in the course of last summer, voluntarily started "excursion trains" on their respective lines, which conveyed passengers out and home at fares little exceeding a penny a mile for the trip, or a halfpenny per mile for the ground actually travelled over? On the Brighton line these trips were so popular that *three thousand* persons were so conveyed Sunday after Sunday, and there being a deficiency of third class carriages, second and first class carriages were called into requisition; the charge being a single third class fare for the double journey. Again; when it was enacted some years back that the railway companies should be bound to convey soldiers at a penny a mile;—this again was considered a hardship. Yet we have occasion to know that they were so conveyed at a profit, and that the directors would wish nothing better than an order to convey five hundred soldiers every day at these rates.

What is the evident deduction from these facts? Is it not this,—that the present scheme of fares by railway is about thrice higher than necessary; and that if they were reduced proportionally, the public would flock to make use of them in numbers not threefold but thrice threefold greater. The rationale of the above facts may be easily appreciated upon the following considerations. 1st. That the train once started, the weight of the engine and tender forms so large a portion of the whole weight to be carried, that the affixing of a few carriages, more or less, makes but a slight proportionate difference in the consumption of material. 2ndly. That to convey people in a decently covered carriage can cost little or nothing more than in an open one. Mr. Vignoles has calculated the expense of working a train at an average of 3*s.* per mile, of which 2*s.* is charged to the locomotive, stock, and repairs, 4*d.* to the carriages, and 8*d.* to government duty.

But there are some truths which can only be forced upon people's comprehensions by dire necessity; and, in the case of the railway proprietors, we doubt whether they will begin to see their interests and those of the public to be identical, until they meet with some potent "ocular proof" in their balance sheets at the end of the year. For the public, they have nothing to hope, except through the operation of that wholesome agent, competition, which we are glad to find the railway proprietors, monopolists as they were considered at first, and as they fondly considered themselves, are not to be exempt from. We have already competing lines projected; to York, in Kent, to Brighton, and various other places; amongst which one to North Wales, (which we shall allude further to presently,) which must interfere with the Birmingham and Grand Junction monopoly. Indeed, in the matter of goods conveyance, we see by a paragraph in the papers the other day, that goods have been sent to London from Birmingham, round by Gloucester and the Great Western, at cheaper rates than those charged from Birmingham direct. Once get the existing great companies to play at cross-firing, by means of branches already established, or to be established, and they must come to their senses.

But more important still than this competition between existing lines, or additional lines upon the existing system, is that which begins to manifest itself in the new systems of transit which are daily projecting, and daily forcing their claims into greater notice. Travelling by mechanical means is yet but in its infancy; gigantic as the principle is, it is far yet from having attained the growth of a giant, or put out the mighty ramifications of which it is capable. Locomotive travelling—that is, the travelling by mechanical power accompanying the convoy, is but one species of the possible systems of mechanical travelling. The other is the travelling by means of stationary mechanical power placed at intervals along the line, and acting through various media. Of the latter, we may mention the atmospheric principle, where atmospheric air is the medium, and the hydraulic, where water is so employed; to say nothing of the endless rope which, though employed on the Blackwall railway, and on some short portions of the Birmingham and others, would probably not be made applicable to an extended line. Moreover, upon the locomotive principle itself, there are several projects, as the wooden system and Kollman's patent locomotive, which, should they come into operation, must interfere more or less with the capital already laid out upon the existing lines. We need hardly add that it will become the duty of the proprietors of these lines, as the march of invention and improvement goes on, to consider how far they may be able to make the new resources resulting from it, applicable to the conditions of the respective property.

With these general introductory remarks, which have extended to a greater length than we had anticipated when we sat down, we have now to call attention to an important paper which appears in the last part of *Weale's Quarterly Papers on Engineering*, a work of first-rate authority, and executed in a first-rate style of excellence, which we hardly hesitate to say has done more towards promoting the rapid strides in engineering science, which have been making of late years, than all the rest of the scientific works published in the same interval. Indeed our thanks are due generally to Mr. Weale for the valuable additions which he has made to our literature in the particular department which he has taken up as his own. The article in the *Quarterly Papers* with which we have now to deal is the translation of M. Arago's " Report on the Atmospheric Railway System," a most lucid and able document, which puts the matter in a clear and fair light. After a brief history of the atmospheric project, beginning with Mr. Medhurst in 1810, and ending with Messrs. Clegg and Samuda at the present day, M. Arago proceeds to give a description of the contrivances of the latter gentlemen as carried into successful operation in the Dalkey Railway. The main difficulty, as our readers are doubtless aware, was how to effect a continuous connexion between the piston in the tube underground and the carriages above, without destroying or impairing the vacuum in the former, which was the tractive power. M. Arago's account is so extremely lucid that it hardly requires the aid of a diagram to elucidate it:—

" We shall now say a few words on the manner in which they have contrived to establish an immediate and unyielding connexion between the piston on which the atmosphere acts as a moving power, and the leading carriage of a train running outside the tube on the ordinary rails. This inflexible connexion, of which we have just spoken, could not be established conveniently, except by means of a metal rod passing from the piston to the carriage. Now, as it is necessary that this connexion should be maintained during the entire course of the piston, there must be a longitudinal opening in the upper surface of the tube. It is along this upper slit that the metal arm travels, by means of which the movement of the piston is communicated to the leading carriage of the train, and thence to all the others. This rod or arm has been very justly called the *connecting* or *moving arm or plate.* But, it may be asked, if there is an opening in the tube, how is the vacuum to be produced? We give the reply. The opening is continued the whole length of a valve, by which it is hermetically closed; the vacuum can be thus successively produced in that part of the tube to the left and right of the piston, as in the closed tube of which we have spoken in the commencement. By a movement, to which we shall presently refer, the valve is partially opened near the piston, so as to let the *connecting plate* pass; after which it immediately falls by its own weight. This is the most delicate part of the apparatus. If the valve accurately closes the opening, a perfect vacuum is produced and maintained, by which we obtain a permanent and powerful moving force. On the contrary, should the valve allow the air to enter by any fissure, we cannot produce a sufficient vacuum but by having recourse to a very powerful air-pump, and, moreover, this imperfect vacuum can only be supported by the continued action of the pump. The longitudinal valve which closes the opening of the tube, is formed of a strip of leather, of indefinite length, strengthened above and below by a series of iron plates of thirty centimètres long, (about one foot,) and not leaving a space between them of more than a centimètre, (about three-eighths of an inch.) Weight is thus given to the valve without destroying its elasticity. The leather is closely and hermetically fastened, by one of its edges, to one side of the opening. The other edge remains unattached and moveable, and, when the valve is closed, it merely rests on the second lip of the opening, which has been previously covered in its entire length by a composition of wax and tallow. When the valve opens, that edge of the leather fastened to the tube bends, and thus acts as a true hinge.

" Messrs. Samuda's valve is never raised to a perpendicular position; its movement never exceeds an angle of 45°. The opening is then sufficient to give passage to the moving plate, which is large and considerably bent, and unites the piston to the guiding carriage.

" This plate, the necessity of which every one must see, is placed a little *behind* the piston, so that the air can never freely penetrate into that portion of the tube which the piston is about to enter. In reality, the rising of the valve is not directly caused by the action of the arm; this movement is produced by two rollers placed in the tube, *behind* the piston, and a little in front of the arm.

" The mere falling of the valve by its own weight does not give it sufficient adherence to the edge of the opening, so as to prevent the entrance of air into the tube; therefore, it scarcely resumes its place before it is heavily pressed by a wheel fixed at the back of the leading carriage, to which also is attached a cylinder filled with burning charcoal, for the purpose of melting the composition of tallow and wax of which we have before spoken."

M. Arago, having explained the contrivance of Messrs. Samuda, which is now in actual practice, proceeds to describe a project put forth by an ingenious countryman of his own, (M. Hallette, of Arras,) for the hermetic longitudinal connexion. How far the latter may succeed in practice it would be presumptuous to speculate; but we must confess, that as regards simplicity and neatness we are prepossessed in its favour, above the certainly complicated arrangement of Messrs. Samuda. But we will let M. Arago describe it:—

"The propelling tube of our countryman, like that of Messrs. Samuda, has a longitudinal opening in its upper surface. The opening is placed throughout its whole length between two hollow semi-cylinders of metal with their concavities facing, forming part of the main tube, and cast together with it. In each of these longitudinal concavities M. Hallette places a tube of thick and close-woven material, rendered impervious by the usual well-known means; air is compressed into these tubes by fixed engines, which, acting in another manner, produce the vacuum in the main propelling tube.

"By their swelling externally, these hose exactly fill the metal semi-cylinders, and by a similar operation towards the centre of the tube, they are brought in contact, or, more properly speaking, press against each other in such a manner as to close the opening hermetically.

"In the ingenious system of the talented Arras inventor, (M. Hallette,) it is not, as may be seen, on the *edge* of the longitudinal groove that the propelling tube is closed. The groove remains open and free, but the two swollen hose prevent the air from entering from above by their mutual contact, and laterally, because they rest very accurately on the interior surface of the two semi-cylindrical ears or continuous bosses, placed right and left of the groove.

"We have here no valve for the connecting arm to lift. In moving, it enters between the two swollen hose and separates them for a moment. Neither is there a compressing wheel, nor a composition to be melted; the elasticity of the air injected into the hose is sufficient, and after the passing of the arm, this elasticity replaces every thing in its original position.

"Before we proceed further, it may be well to remark, that the connecting arm at that part on a level with the two swollen hose in contact is of but trifling thickness; its form is that of a thin lens, having the edge in the direction of its movement, so that it is never necessary the hose should be at any time considerably separated, and they come suddenly in contact as soon as that narrow portion of the lenticular moving or connecting arm has passed."

Having thus fully explained the nature of the available material, presented for the purposes of the atmospheric principle, M. Arago puts the question of expedience very fairly: "At the first view," he says, "we may ask ourselves if we can hope for future success from a system of locomotion, into which enters, as principal agents, a strip of leather of immense length, a composition of wax and tallow, and a hot iron to dissolve the wax, or would it not be better to occupy ourselves in rendering more perfect the ordinary locomotive?" The question he considers is answered by experience, that of the Dalkey Railway, which had then (September, 1844) been open more than two months, during all which time the leather valve had worked satisfactorily. True the Dalkey line is only a mile and a quarter in length. But then it comprises in that length sinuosities and acclivities far more severe than any railway on the old system had been subject to, or could possibly be applied to, and which it has been able to surmount at a rate of fifty miles an hour. M. Arago admits that it will be a matter for experiment how the principle of atmospheric exhaustion applied to a tube of longer extent may be successful, and at what distance it may be proper to place the stationary engines. But the principle itself he considers established by the experiment of the Dalkey line, and he concludes by recommending the application of the same principle upon a line of seven miles, from Villette to Sevran, on the right bank of the Ourcq Canal.

This recommendation has been adopted, and the works commenced. In this country also, it may be added, that amongst the mass of railway projects coming before Parliament in the ensuing session there are those upon the atmospheric principle, in the aggregate extending to some three hundred miles. So that the capabilities of the system, and its supposed advantages over the existing system, must soon be brought to a fair practical test: those advantages, as claimed by the proprietors, being, I. *Increased economy;* first, in regard to the original outlay, the line not requiring to be straightened or levelled, lateral bends and steep acclivities being no insurmountable obstacle to its "powers of suction;" secondly, in the consumption of fuel and in the wear and tear of material, the weight of the trains being enormously lessened by the absence of the locomotive, and the structure of the carriages being also lighter in consequence. II. Increased safety and comfort; it being impossible for two trains to come in collision, and almost impossible for a carriage even in the rear of a train to go off the line, and thus less noise and a total absence of smoke and coke ashes. III. Increased speed; fifty miles per hour being competent to it, with an ordinary working train; whilst five and twenty miles an hour is considered fast travelling on the fastest of the existing railways, namely, the Great Western.

Since the above was written, we have met with the account of a new system of atmospheric propulsion, for which a patent has been taken out by Mr. James Pilbrow, C.E., and which he describes in a work just published, entitled, " Atmospheric Railway and Canal Propulsion and Pneumatic Telegraph." By this plan, the necessity for the continuous valve running along the upper part of the propulsion tube is entirely avoided; the connexion between the propulsive principle within and the carriages without being obtained in a manner entirely distinct. The grand distinction between the system of Messrs. Samuda and that of Mr. Pilbrow is that, in the former, the connexion between the cariage train and the propulsion piston is direct, in the latter it is indirect, a third medium being employed.

We will endeavour to give our readers a notion of Mr. Pilbrow's contrivance in as few words as possible, the details being too complicated to be made intelligible without abundant engravings. Mr. Pilbrow's pneumatio, or propulsion tube, instead of being broken or stopped at intervals of a few miles, as in Messrs. Samuda's plan, extends unbroken the whole length of the line. The consequence of this, and the comparative absence of leakage, will be that the stationary engines, instead of being required every three miles, may be much more distant, say, perhaps, ten miles apart. But the most important point in favour of this simple and unbroken propulsive medium is, that it gets rid of all the difficulties and objections to which the present atmospheric principle is subject in regard to crossing and diverging lines from the main trunk. These are great advantages, too obvious to need enforcement, and if Mr. Pilbrow accomplishes in practice what he promises in his specification, he will have made a most important step in railway progress.

The means by which Mr. Pilbrow proposes to propel his train is this:—At intervals, on each side along his propulsion tube, say every thirty yards, he places boxes with one side opening into the tube. Within these boxes are cogged wheels, working horizontally on an axle, the upper portion of which passes through a stuffing case inserted in the top of the box, and at the outside, or above these boxes, the same axles are made to bear cogged wheels similar to those inside the box. Attached to the propulsion piston is a long rod or bar, nearly the width of the tube, and running along with the piston inside the tube. Either side of this bar is covered with cogs or teeth corresponding with those on the wheels within the side boxes above described. It should be mentioned also, that these cog-wheels are made to project in a slight degree within the propulsion tube. The manner of working this apparatus is simply this:—the air being exhausted from the propulsion tube, the piston, with its cog-rod attached, moves along inside it, and as it moves, the cogs of the rod working in those of the wheels at the sides, turns them round, and as they turn the cog-wheels outside, the boxes turn also. These external cog-wheels are then made to act upon the train by means of a cog-rod attached to it, similar to that attached to the piston within; and thus, as the piston moves along inside the tube, the first carriage of the train moves along over it outside the tube, through the medium of this double set of cog-wheels and rods.

Such is the mere outline of Mr. Pilbrow's ingenious scheme. The details of arrangements for the practical working of it, for the stopping of trains, the crossing of lines, &c., would be too complicated to enter upon here. We understand that Mr. Pilbrow has tried his plan upon a small scale, and that it has been found to answer his expectations.

PROJECTILE WEAPONS OF WAR AND EXPLOSIVE COMPOUNDS.

By J. Scoffern, M.D.

Lecturer on Chemistry, at the Aldersgate College of Medicine.

(Continued from p. 431 of Vol. I.)

ON THE APPLICATION OF GUNPOWDER TO MILITARY PURPOSES.

This subject is, as we have already remarked, distinct from the discovery of gunpowder; it may be considered under the following heads:—

The application of gunpowder to the purpose of projecting weights from tubes.

The application of gunpowder to the purposes of mining.

The application of gunpowder to effect the bursting of hollow spheres—called shells, grenades, &c.

The application of gunpowder in elaborating the rocket[a].

When treating of the history of gunpowder, we carried its invention, by reference to documents, to a period anterior—how much we know not—to the period of Marcus Græcus, or Gracchus, who lived in the eighth century. We mentioned, however, the probability that it had been known in Asia from time immemorial, and quoted several treatises having reference to this subject. Without alluding to the latter again in detail, it may be sufficient to remark, that not only do they allude to gunpowder, but also in most instances to guns: this remark applies most particularly to the code of Gentoo laws, which was printed by the East India Company in 1776. Whatever truth, however, may be accorded to those oriental documents, (and we consider that collateral testimony is in favour of their credibility,) it is certain that either the period when fire-arms were introduced from Asia into Europe is either forgotten, no record of it having been made, or that the European employment of these weapons was altogether due to a fresh discovery. Marcus Græcus, although he mentions gunpowder and its application to many pyrotechnical devices, says nothing about its application to guns, which can scarcely be accounted for on any other supposition than that he was unaware of their existence.

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[a] Chemically speaking, the material for filling rockets *is gunpowder*, i. e. a mixture of nitre, sulphur, and charcoal, although the proportions of these ingredients are different from common gunpowder.

This circumstance is in favour of the opinion that the employment of fire-arms in Europe was the result of an European discovery. Another circumstance may be mentioned to the same effect, although it does not rest on very good testimony.

The reader has already been made aware that the Germans claim the invention of gunpowder for their countryman Bartholdus Schwartz. We have already discussed that claim, and proved that he has no pretensions of the kind whatever;—this is indisputable, yet it does not seem so clear that he might not have originated the idea of applying the force of gunpowder to missile weapons. It is said that this individual was operating in a mortar on a mixture of nitre, charcoal, and sulphur—(gunpowder in fact)—that the mixture exploded, urging the pestle to a considerable distance,—that hence originated cannon,—and also the military term *mortar* as applied to a particular variety of cannon.

All this seems plausible enough, and may be true; but seeing that the use of fire-arms first became prevalent in Europe in those countries which mixed with the Saracens; and that cannon are described by Arabian authors as early as 1312;—considering, moreover, the scientific character of this people, and duly weighing the testimony of oriental nations, we are constrained to lean to the opinion that fire-arms were not re-invented in Europe.

Guns may be divided into artillery (in its modern acceptation) and small arms; not that the division is very correct, inasmuch as ancient small arms were *all cannon*, yet the division will answer our purpose.

The term cannon is most probably derived from *καννα*, or in Latin *canna*, a reed, although some persons refer it to the Greek *κανὼν*, signifying the beam of a steel-yard, a reed, cane, rod, &c. Older military writers make use of the term cannon just as we do *barrel*, including that part of all fire-arms, whether large or small. We restrict it to artillery.

The first cannon were called bombardæ, from *βομϐος*, or "a bombo et ardore," on account of the great noise which the firing of them occasioned.

A very few words will suffice to express all we know relative to the first employment of cannon in European warfare. It is generally believed that they have been commonly employed since the year 1338, at least Father Daniel, in his Life of Philip of Valois, seems to have proved this from the records of the Chamber of Accounts at Paris. Du Cange, indeed, finds them mentioned in Froissart and other French historians, some time earlier. Although the French employed cannon in 1338, for the purpose of demolishing some castles, they did not use them in the field so soon as the English, who, in 1340, under Edward III., placed five of them on a small hill near the village of Crecy[a]; and this, it is said, contributed not a little to the success of that celebrated battle. This circumstance has been quoted by some French authors as a proof of our greater *barbarity*, in setting the example of killing our fellow-creatures by such murderous engines.

"On ne faisoit" (says one of them) "point encore usage en France, en 1547, de cette arme terrible contre les hommes; les Français s'en étoient bien servis in 1338, pour l'attaque de quelques châteaux, mais ils rougissoient de l'employer contre leurs semblables. Les Anglais, moins humains, sans doute, nous devancèrent et s'en servirent à la célèbre bataille de Creci, qui eut lieu entre les troupes du roi d'Angleterre, Edouard III., qui fut si méchant, si perfide, qui donna tant de fil à retordre à Philippe de Valois, et aux troupes de ce dernier; et ce fut en majeure partie à la frayeur et à la confusion qu'occasionnèrent les canons, dont les Anglais se servoient pour la première fois, qu'ils avoient postés sur une colline proche le village de Creci, que les Français dûrent leur déroute."

In the time of Henry III. of France, the use and practice of artillery was still in its infancy; D'Etrees, the master-general of the ordnance in 1558, was the first who made any progress in the construction of batteries. Before his time, continual accidents occurred from the bursting of cannon, and it was usual to cool them with vinegar, in order to prevent these misfortunes; scarcely a worse plan could have been followed. Armies were at this period but slenderly provided with cannon, which were thought chiefly necessary for sieges; at least such was the opinion in France[b]. In England, however, the science of artillery was further advanced; and Lord Herbert observes, that in 1544 Henry VIII. had invented small pieces of artillery to defend his waggons[c]. When cannon were drawn by horses instead of oxen, and could keep pace with a moving army, it was thought to be a great achievement.

Before the fifteenth century, cannon were designated by various fanciful names; then, however, they began to be indicated by the weight of their balls, as at present. Much celebrity was formerly acquired by several cannon in various countries, but the most famous of all seems to be that enormous gun used by Mahomet II. against the Greeks, at the siege of Constantinople, in 1453. It was cast at Adrianople, by a Dane or Hungarian named Urban, who had deserted from the Emperor Constantine Palæologus. It is thus described by Gibbon: " At the end of three months, a piece of brass ordnance was produced of stupendous and almost incredible magnitude; a measure of twelve palms is assigned to the bore, and the stone bullet weighed above 600 lbs. A vacant place before the palace was chosen for the first experiment, but to prevent the sudden and mischievous effects of astonishment and fear, a proclamation was issued that the cannon would be discharged on the ensuing day. The explosion was felt or heard in a circuit of 100 furlongs; the ball, by the force of gunpowder, was driven above a mile, and on the spot where it fell it buried itself a fathom deep in the ground. For the conveyance of this destructive engine a frame or carriage of thirty waggons was linked together, and drawn along by a team of sixty oxen; 200 men on both sides were stationed to poise and support the rolling weight; 250 workmen marched before to smooth the way and repair the bridges, and near two months were employed in a laborious journey of 150 miles."

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[a] This fact is doubted by some. Froissart does not mention it, which is not easy to account for, if it were true. We have, however, the testimony of Petrarch to show that cannon were common before the year 1344, *nuper rara nunc communis*. According to Babour, Edward III. was supplied with cannon as early as 1327.

[b] Wraxall's History of France, vol. ii. p. 249.

[c] Figures of these gun-waggons may be seen in Grose's Treatise on Military Armour.

Any person who has the slightest mechanical knowledge must be aware that the formation of a cannon, or indeed of any other fire-arm, is necessarily a somewhat difficult task, requiring various mechanical contrivances only to be met with in comparatively civilized countries. It is not to be wondered at, therefore, that the resources of our ancestors were but slightly inadequate to this end. The first cannon employed were nothing more than bars of iron arranged in such a manner that their internal aspects should form a tube;—the bars were not welded, but merely confined by hoops. On some occasions, expedients much less efficient than this have been had recourse to;—cannon having been made of coils of rope arranged in a tubular form, and even of leather, or of wood. Of course nothing like perfection of form or bore was then attempted, indeed was not desirable, inasmuch as no amount of science, either mathematical or chemical, was then applied to artillery practice.

Cannon seem long after their first invention to have been regarded with a sort of awe and mystery—the flight of their projectiles was considered to be totally different from all other projectiles, and the wounds occasioned by fire arms generally, were thought to be all but necessarily mortal [a].

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[a] This might easily be accounted for by the unskilful surgery of those days. The army surgeons were assuredly the most effectual of all destructive engines. We remember meeting with a recipe for a gunshot wound, which

Tartaglia, whom we formerly quoted in reference to the composition of gunpowder, was the first to apply mathematical reasoning to the practice of artillery[a]; he took considerable trouble to prove the now well-known fact that no portion of the flight of a cannon-ball was a straight line, but that a curve was described from the very beginning of its course; he moreover proved, that a cannon shoots furthest at an elevation of 45°. Tartaglia, moreover, is reputed to have discovered the gunner's quadrant.

It remained for the great Galileo and his pupil Torricelli to investigate more narrowly the law of falling bodies. Tartaglia proved that a cannon-ball, when shot from the gun, moved in a curve; it remained for Galileo to determine that this curve was the parabola, provided the ball fell on the same place as the battery from which it was shot, and that the gun was elevated above the horizon; that, moreover, it was half a parabola, provided, under the same circumstances, the gun were pointed horizontally.

Torricelli extended these discoveries; he showed that whether the ball fell above or below the plane of its projection, it described a parabola of smaller or larger amplitude, according to the angle at which the gun was elevated and the strength of the powder.

Before the time of Galileo, artillery practice was imperfect, chiefly because no mathematical knowledge whatever had been applied. After the time of this philosopher, artillery practice was imperfect, chiefly because his views were too exclusively adopted without attaching due importance to collateral and interfering causes.

Moving as we do slowly through the atmosphere, which cleaves and mingles again so that it has become the very type of non-resistance, we are scarcely competent to judge of the immense force which it exercises against a projectile moving with great velocity. Galileo's experiments were performed with slowly moving bodies, on which atmospheric resistance could have had but little effect, so that the parabolic curve would have been but slightly departed from, hence he did not fully appreciate the influence attributable to this cause. Galileo, however, was not unaware that the air really did exercise some resistance, but he believed it to be more insignificant than it is.

The views of Galileo were adopted almost universally. Our

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we cannot now recollect in its details, neither can we fix on the authority. The prescription was, however, somewhat to this effect. Take of oil and of wine equal parts, boil them, and then project into them a dog yet living; the animal was to be well boiled, and his flesh, together with the oil, wine, and other ingredients, formed the application!

[a] See his *Nova Scientia*, published at Venice, in 1537, and his Quesiti et inventioni diversi, Venice, 1546.

countryman Anderson, in 1690[a], laboured hard to prove their correctness, and M. Blondel, in France[b], maintained a similar opinion. Dr. Halley, in 1686, expressly asserts, that "in large shot of metal, whose weight many times surpasses that of the air, and whose force is very great in proportion to the surface wherewith they press thereon, this opposition is scarce discernible," and he infers from the result of observation, that "although in small and light shot, the opposition of the air ought, and must be accounted for, yet in shooting of great and weighty bombs, there need be very little or no allowance made[c]. Artillerists might have been led to doubt the truth of this determination of Dr. Hutton, by the authority of a still greater name—Sir Isaac Newton, who, in 1687[d], demonstrated that the curve described by a projectile, in a strongly resisting medium, differed from a parabola, and that the resistance of the air was great enough to make the difference between the curve of projection of heavy bodies and a parabola far from being insensible, and therefore too considerable to be neglected. Huygens in 1690 made a similar statement.

Notwithstanding the testimony of two such names, and better testimony still—that of practice, the error of Galileo continued to be propagated. Blondel had calculated tables according to this theory, and they were pronounced incontrovertible.

In 1716, however, Mr. Ressons, a French artillery officer, did not hesitate to assert, in a memoir presented to the Royal Academy[e], that theory was of very little service in the use of mortars, and that practice had convinced him there was no theory in the effects of gunpowder.

It may be asked, why it was, that the errors of the parabolic theory were perpetuated, when there was so easy a test as actual practice to determine their value? The answer is, that many were paralyzed by the great name of Galileo, and did not venture to think for themselves; others there were who attributed the want of accordance existing between theory and practice, to some interfering cause—any thing, however, but the true one.

Our countryman Anderson, whom we have quoted more than once, endeavoured to strengthen the doctrine of Galileo, by appending to it a very curious one of his own. He granted that cannon balls, like other projectiles, ultimately began to describe in their course the parabolic curve—but that before they did this, they continued to be impelled for a certain period in a perfectly straight line, which he termed *the line of the impulse of fire.* In this state of uncertainty did this theory of projectiles remain, until Mr. Robins published, in the year 1742, his treatise, called "New Principles of Gunnery." The principles developed in this treatise were soon after confirmed by M. Euler, of Berlin; M. Leroz, of Paris[a]; and by Dr. Hutton.

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[a] *Genuine use and effects of the Gunne,* 1674.

[b] *Art de jetter les Bombes, Par.* 1683.

[c] Phil. Trans. No. 179, p. 19.

[d] *Principia,* lib. ii. § 7.

[e] Discours de la Cause de la Pesanteur, Leide. 1690.

It does not form part of our scheme to detail the various experiments or mathematical calculations by which Mr. Robins arrived at his celebrated result; we may mention, however, this much generally, that having devised experiments and made calculations, which at this day are admitted to be correct, at least in all their leading particulars, he proved that the parabolic theory, as applied to projectiles urged with slow velocities, was not far at variance with practice, but that this theory, when applied to rapidly moving bodies, such as shot and shells, was utterly false; that the fallacy was occasioned by atmospheric pressure chiefly, and that this pressure increased with such enormous rapidity, as compared with increase of projectile force, that the ratio between the two could not be calculated.

If this assertion be true, (and no one at all conversant with the subject at all doubts it,) what becomes of the opinion,—the visionary hopes of those who think to accomplish unheard-of ranges by increase of projectile force? Granting that the atmosphere exerts a resistance increasing with the velocity of a ball, it is evident that a point at length is arrived at, when both these forces, namely, the projectile force of the ball and the resistance of the atmosphere, are equal,—beyond this no increase of projectile force can increase the ranges, simply because in the same ratio as an explosive material, be it gunpowder or any thing else, urges a body forwards, the air forces it back. These are the limits of theory, but in practice we cannot go so far.—We have supposed it possible to find cannon strong enough to withstand this projectile effort,—balls strong enough to resist the shock without breaking,—and gunpowder possessing just that degree of force, neither more nor less:—all this is out of the question.

These arguments have tended to prove the impossibility of accomplishing more than a given range, by any increase of *initial* power whatever—*we do not assert that such range may not be increased by other appliances*—this consideration will be reserved for a later period. We will proceed now to observe that the public, at least the non-chemical portion of it, attach a very wrong signification to the words *strong* and *strength;* for instance, oil of vitriol is said to be a strong substance, and water a weak one; yet a chemist really has great difficulty to understand what is meant by such an application of the term. We have more than once appeared to be hypercritical pedagogues,—nay, we have seemed even rude—when, on being asked whether this or that substance was strong, we have proclaimed our incompetency to understand the meaning of the question.

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[a] Mém. Acad. Scien. for 1751.

We once knew a wicked young urchin who amused himself by displaying the wavering intellectual powers of his grandmamma by such questions as these:—If a pound of sugar cost so and so, what will a horse cost? She set about calculating forthwith—not, however, very successfully, inasmuch as no connexion existed, and no comparison could be instituted. Now had this old lady and her grandson known chemistry, he might just as well have varied the question thus:—The strength of oil of vitriol being supposed to be one, what is the strength of water? The two cases are really analogous.

We beg pardon of the reader for this flippant digression, but without any quibble or finedrawn disputation whatsoever, the words strong and strength are very fallacious, and, therefore, the notion which the public have of projectile weapons and projectile compounds, is, among other things, very incorrect.

An ounce of gunpowder fired loosely scarce makes a noise,—a little smoke, a little fire, a little smell of sulphureous gas, and all is over; yet the same ounce of powder, in a musket, would be a large charge, far more than necessary to urge with deadly effect a heavy leaden ball.

An ounce of fulminating silver, on the other hand[a],—nay, but who would dare to handle an ounce of such a substance?—say the *ninety-sixth part of an ounce*, or just five grains; well, five grains of fulminating silver are taken out of a paper, with much fear and trembling, touched with no hard substance, for fear of explosion, then gently laid on a piece of metal—say a penny piece;—then, suppose it ignited by means of a very long stick, with a match at one end; and—begging the operator's pardon—with a somewhat rash man at the other:—what is the result? A terrible crash, which deafens the operator for some days, and the penny piece is almost bent double! "How strong!" exclaims a non-chemical operator;—"how well this will project a ball."—He tries a small charge in a musket, and what are the results?—why, the gun is burst, the iron literally rent into threads and fragments, the ball perhaps *is* projected, but to a very inconsiderable distance, if of lead, flattened as if by a hammer; if of cast iron, *broken into fragments!* Now which shall we say is the stronger substance, gunpowder or fulminating silver? The force of all explosive bodies depends on the gases which are liberated during explosion, and the peculiar effects of their explosion depend on two separate circumstances, the total quantity of gas eliminated, and the rapidity of its elimination. Gunpowder, perhaps, compared weight for weight with fulminating silver, liberates more gas of the two, but not so rapidly, the liberation is progressive, not instantaneous; hence its immediate disintegrating effects are not so considerable as those of fulminating silver, but as a projectile agent, it is more efficient. We just think of one more case, which will tend to show how different are the requisites for mere impulse and prolonged motion. Suppose a railway carriage on the line, ready to move on the application of proper force, a sixty pound cannon ball is fired at it *directly aft*, as the sailors would say, therefore the carriage has a tendency to move forward; yet, instead of doing so, it is shattered to pieces. One single man, however, applying his force, pushes it forward with great ease. Who then is the stronger of the two, a man, or a sixty pound cannon ball in full flight? The question is unmeaning, yet not more unmeaning than many others of its class often asked by the non-scientific public. We trust, then, that we have shewn, that not even is there a theoretical limit to the rate of motion of a projectile, but that practically this extreme limit cannot be attained, partly because of the want of cohesive strength in cannon and cannon balls, partly because the quantity of gunpowder necessary to effect this would be inconvenient, and partly because all other explosive compounds are inapplicable.

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[a] Chemists are acquainted with two kinds of fulminating silver. The kind here alluded to is the white compound termed in chemical language the *fulminate of silver*. It is far less dangerous than the dark or ammoniacal fulminating compound, which, when made, can scarcely be removed from the containing vessel, so prone is it to explode.

At this period it will not be necessary to point out elaborately all the reasons which could be adduced to prove how incorrect is the *practical* application of the parabolic theory: the first, and best, and only one necessary to disprove the doctrine is, *that practice will not confirm what theory pronounced to be true*—in all cases this evidence is enough. We shall not mention any other reason, as tending to confirm an opinion,—but as inevitably leading to the same conclusion by an independent train of reasoning; and at the same time affording us important guidance for our judgment of a future question not yet proposed: namely, granting the possibility of a range, of six or twelve miles, to be accomplished by an initial impulse; what will be the amount of correctness with which the flight of such a projectile can be directed?

It is evident that if no resistance save that of gravitation impeded the flight of a projectile, the trajectory curve should be merely vertical: that is to say, supposing the projectile to be spherical, and homogeneous in such a manner that its centre of gravity and spherical centre might correspond. True it is that such a correspondence is not possible to be effected,—and consequently, the trajectory curve may be partly vertical, partly horizontal, even supposing the ball to fly in vacuo. Deviation however from this cause should be very slight, and should increase in proportion to the distance from the mouth of the piece only. This however is contrary to experience,—the same piece which will carry its bullet within an inch of the intended mark at 10 yards distance, cannot be relied upon to 10 inches in 100 yards, much less to 30 inches in 300 yards. This has been proved beyond doubt by Mr. Robins, who found that a perfectly fixed musket barrel, would when fired project a ball with an accuracy, at 180 feet, sufficient to hit a mark one-seventh of a foot square, 15 times out of 16; yet, at a distance of 700 yards, the balls not only varied as to their vertical plane, but sometimes went 100 yards to the right or left of the intended line.

Although we have attributed this great deflection chiefly to the air, we have not said how it is occasioned. It is partly attributable to the fact, that balls cannot be made without inequalities on their surface, on which the air must therefore act unequally; but the chief cause seems to depend on the irregular whirling motion which the ball acquires on leaving the gun, and which causes the ball to present its surface to the air in a direction very different from what it would do if there were no such whirl. Deflections from the causes enumerated will occur even if the ball fit the barrel perfectly,—but there is yet another usual cause of deflection, namely windage, as the space is called between the shot and the barrel. This we shall allude to hereafter.

All these remarks concerning the irregular flight of projectiles, came under our notice incidentally, in connexion with the Galilean theory of the parabola. Before, however, returning to the historical portion of our subject, we will lay before the reader a table of atmospheric resistance, &c., to the flight of balls.

Table of the motions of a 24 lb. shot projected at 45° of elevation.

Velocity per second.	Range in vacuo.	Range in Air.	Range corrected.	Height to which the ball rises.
Feet.	Yards.	Yards.	Yards.	Yards.
200	415	320	330	100
400	1,658	1,000	1,019	300
600	3,731	1,391	1,419	400
800	6,632	1,687	1,719	464
1,000	10,362	1,840	1,878	515
1,200	14,922	1,934	1,978	561
1,400	20,300	2,078	2,129	606
1,600	26,528	2,206	2,264	650
1,800	33,574	2,326	2,391	694
2,000	40,450	2,438	2,510	738
2,200	50,155	2,542	2,622	778
2,400	59,688	2,640	2,726	816
2,600	70,050	2,734	2,823	852
2,800	81,241	2,827	2,916	887
3,000	93,262	2,915	3,002	922
3,200	106,111	2,995	3,085	996

The first column in this table contains the velocity in feet of a 24 lb. shot, projected at an angle of 45°; the second column shows the distance in yards to which the ball would go in vacuo on a horizontal plane; the third column contains the distance to which it will range though the air, considered all of the same density as at the earth's surface; the fourth shows the same range corrected for the diminution of the air's density as the ball ascends, and is therefore called the corrected range; and the fifth column shows the height to which the ball rises in the air, or the height of the vertex of the curve above the plane.

It may be observed by reference to this table, how immense is the difference between the motion of projectiles in air and in vacuo, especially at large velocities. It is seen that the ranges instead of increasing in a duplicate ratio of the initial velocities, as in vacuo, really increase much slower; in all cases of military service, and in the most useful cases, *viz.* from 800 to 1600 feet, they increase nearly as the square roots of the velocities.

[To be continued.]

CHEMISTRY.

ON THE MANUFACTURE OF GERMAN PORCELAIN WARE.

CHEMISTS are greatly indebted to the firm of the Messrs. Chamberlain, of Worcester, for their successful exertions to supply them with an article which hitherto could only be obtained from Germany, and which gave its celebrated chemists an undue advantage over their English brethren, as in the progress of any chemical research, if any form of apparatus was required differing from those imported, several months must elapse before it could be obtained, and then at the nearly certain risk of its being incorrectly made. This dependence upon a foreign market has long been felt as a most serious inconvenience, and several manufacturers have, at the suggestions of chemists, made some trials to imitate the—we have pleasure in admitting—very beautiful ware imported from Germany, but their attempts have served but to prove how far inferior we are in this branch to our neighbours. The Wedgewood ware, which some years back was regarded as perfect, and very large quantities of which were exported, has, from the progress of improvement on the continent, become superseded even in our own laboratories. The German ware is marked with a blue arrow, it has the most striking advantages over the English ware: it is capable of resisting the action of concentrated acids and alkalies; it can withstand nearly every change of temperature, however suddenly varied, and immense quantities, to the amount of several millions, have of late years been imported. This, thanks to the exertions of the Messrs. Chamberlain, will not be longer an opprobrium to us. This firm has long been distinguished for the extreme beauty and delicacy of their china at their establishment in Bond Street, and have at their large manufactory in Worcester every facility. They have the finest materials, the best workmen, with furnaces capable of producing the most intense heat; joined to this, their skill in manipulation, so characteristic of this family, has produced an article superior even to the German; nothing can indeed exceed the extreme beauty and finish of the articles we have seen, and which, at the wish of the firm, we have submitted to the severest tests of the laboratory. We have fused potash and every variety of flux, in a crucible made from it, without on microscopic observation being able to detect the slightest injury to the glaze; the same piece was submitted with a like successful result to the action of concentrated boiling acid; we boiled water without injury, the crucible, not previously warmed, resting upon the glowing coals of the furnace, and when boiling, dipped it, without cracking, into ice-cold water, tests which the best German ware could alone withstand, and then not with certainty.

A wide field is now opened to our manufacturers: by the use of this ware, those costly retorts of platinum, involving in a large manufactory the dead loss of several thousands, may be superseded. Manufactures, which the want of such a ware has destroyed, will now be restored to us. Phosphorus, now so largely used in the lucifer matches, every ounce of which is imported, will probably be the first. We have in the Welsh coal an abundant supply of charcoal; our Hetton and Adelaide coals afford us, at the cheapest rate, the power of heat; the materials, bones and sulphuric acid, are to our hand, and better retorts than even the Germans can manufacture, are made, such is railway communication, at our door. There is scarcely a manufacture in which such ware must not prove of inestimable service. Watt's improvement on the steam-engine made England, for a time, the manufacturer for the world; since then manufactures have sprung up in Germany, and in some articles have attained even a superiority; but we trust that the example which the Messrs. Chamberlain have thus set will be followed by others. The manufacture of porcelain is one of great interest; few examining its extremely beautiful texture would be aware that clay and flint were its principal constituents. The clay is brought from Dorsetshire, and an inexhaustible supply of silica exists amidst the secondary chalks of Scotland and Ireland, and on the sea-coast of Brighton. The extreme beauty of the article shows the great care with which every process must be conducted. The water is carefully selected; in Germany rain water only is employed. For the manufacture of their best ware, the German manufacturer prepares his materials at the vernal and autumnal equinoxes, experience having shown him that the rain, from some peculiarity, is at those seasons better adapted for his purpose. This circumstance will at once show how little has been neglected. The clay is ground by knives into the smoothest paste; the flints, heated to redness, and then thrown into cold water, are ground into the finest powder. The use of water during this process has saved many lives, the flint-dust formerly used peculiarly irritating the lungs and laying the foundation for consumption. The mixture, while in a semi-fluid state, is passed through several sieves, to separate any impurities; and the mass then presents the utmost uniformity and smoothness throughout. So great is the affinity which alumina has for silica, that they unite even in the humid way, forming a kind of mortar, and when this becomes hardened by exposure to the sun's rays, it is rendered incapable of decomposition.

The fluid mixture of silica and clay is afterwards slowly and very carefully evaporated, and the mass is stirred with the greatest care, as from the imperfect way in which it conducts heat the lower portion would become burnt to a brick while the upper strata remained fluid; besides, the greater specific gravity of the silica would cause it to sink, and the composition of the mass would be irregular. Even when evaporated to a proper consistence, great labour is expended in more thoroughly blending the mass by working and beating it with mallets, cutting it into pieces, which are forcibly reblended with the mass. The mixture should be then left for a considerable time to blend; and here the Germans have a decided advantage; they leave their mass for several months, while the English manufacturers wait but a few days. The Chinese, whose china is equal to any German chemical ware in resisting changes of temperature, mix sufficient to last not only their own time but that of their sons. The mass is afterwards submitted to pressure by the hydraulic press, which completely expels the air; unless this is thoroughly and effectually done at the high temperature to which it is exposed in the kiln, the air would expand to several hundred times its volume, and blister and spoil the goods. The proportions employed by the manufacturers are of course kept secret; from chemical analysis, we know that the silica is in the proportions of about one-fourth of the clay.

We have seen how carefully every process is conducted, yet till this manufacture of the Messrs. Chamberlain we were far behind the produce of China: their furnaces are far inferior in every respect to ours, yet their china resisted sudden changes of temperature as well if not better than the best German, and was distinguished by a peculiar brilliancy of tint which even the skilful manufactory of the Messrs. Chamberlain has scarcely equalled; and yet upon articles of such beautiful ware the Chinese artist marked his utter ignorance of even the slightest knowledge of perspective; figures were drawn so unlike those of any human being, that a person would believe the artist could never have seen that which he attempted to pourtray. The most brilliant colours were plastered, without any regard to artistical effect.

By analysis, Reaumur detected the existence of cobalt in their blue; this discovery opened at once a mine of wealth for Saxony. The cobalt ore was there used for the repair of roads; from being associated with arsenic, the miners regarded it with horror; they prayed to be delivered from it, and from the demon of which they regarded it as the emblem. It now fetches the high price of thirty shillings a pound, even when impure. The Chinese regard their china as inferior to that made by their predecessors, but on very weak grounds; the fact of beautiful articles being discovered buried would merely prove how highly they were then valued. The clays the Chinese employ are called Ka-olin and Pe-tunt-re; but the principal difference, as apparent to the chemist, is the presence of lime and magnesia. An examination of their china shows to what an intense heat it must have been submitted. But the glazing yet remains, and in this the English chemical ware certainly excels; it received no stain from litmus, one of the severest tests. For common ware salt is used; this volatizes at an intense heat, and gives for common purposes an efficient protection; for china, pure silica made by precipitating silica from the silicate of potash by muriatic acid, and mixing this with an equal weight of oxides of tin and lead. This is beautiful for china, but at a white heat could not be trusted to by chemists.

We had not brought the science to its state of perfection in this country till the discovery of this chemical ware. By analysis chemists had, many years back, informed the manufacturers that the porcelain of Berlin consisted of siliceous sand and sulphate of lime; but this was found extremely difficult to work, as it is not so cohesive or viscous as that which forms hard porcelain; and though Mr. Wedgewood has very much improved his ware, still it is extremely unfit for chemical purposes. The sudden application of an argand lamp is even sufficient to break it. The English chemical ware of the Messrs. Chamberlain appears, however, perfect. The glaze presents that velvety appearance which marks its perfection, it stands every test to which it can be exposed, and from the high character of the firm, we feel certain that every facility will be given to chemists to get what they may require made from patterns: and we hope that, stimulated by their example, Messrs. Pellatt and Green will free us now from the necessity of purchasing our glass from Germany. If the excise laws are, as they plead, the bar to improvement, now, when the revenue is in excess, should the attempt be made to remove this, in the opinion of our manufacturers and chemists, impolitic and injurious tax.

MANUFACTURES.

HER MAJESTY'S ALPACA TEXTURES.

TO THE EDITOR OF THE POLYTECHNIC REVIEW.

Sir,—Having accompanied the Bradford manufacturers to Windsor, Messrs. Thomas Gregory and William Fison, who on the 12th instant were honoured with an audience by Prince Albert, for the purpose of delivering to him the dresses made from Her Majesty's Alpaca fleece by their respective firms, it occurs to me that a description of the textures will be acceptable to your readers. I ought, however, to premise that, some eighteen months ago, the Earl of Derby sent Her Majesty two Alpacas, which were located at Windsor, and much admired. Their beautiful figure and graceful attitudes on the lawn, as well as their mild and gentle demeanour when approached, soon rendered them great favourites, both with the inmates of the palace and visitors. After being shorn, last season, the male unaccountably abstained from food, pined and died, without any ostensible cause, and as unfortunately no *post mortem* examination of the body took place, the complaint remained a secret.

The weight and beauty of the fleece struck every one with astonishment, and Her Majesty, animated with that ardent zeal for the prosperity of our manufactures, which she delights in displaying, as well as in memory of her departed pet, was pleased to express an earnest desire to have articles of apparel made with its wool, for her own wearing. The fleece, almost entirely jet black, was accordingly forwarded through Sir William Freemantle to Mr. Thomas Southey, of Coleman Street, who sent it on to Mr. R. Pollock, of Leeds, with an injunction to select, on so honourable an occasion, the most eminent spinners and manufacturers in Bradford.

The package was placed in the hands of Mr. James Whitley, of Morton Mills, a first-rate spinner of Alpaca yarn, who declared the fleece to be one of the healthiest that had ever come under his notice. It weighed 16½ lbs. including 1 lb. of white, and when sorted and combed 11½ lbs., and spun 10. Messrs. William Fison and Co., and Messrs. Thomas Gregory and Brothers undertook the manufacture, and with the given quantity of material, above stated, felt desirous of producing the greatest varieties of articles possible, showing at the same time some of the admixtures usual in the Bradford trade. It being desirable that no available portion of the Windsor fleece should be lost, and white not offering a suitable contrast with black, the first difficulty that occurred to Messrs. Gregory was, how to use the odd 1 lb. They, however, hit upon the ingenious expedient of having it dyed royal blue, and produced—

1st. A cot cover, or as it is called in the trade, an apron, with the warp, or longitudinal threads, royal blue, and the weft, or cross threads, black; exhibiting, in the damask style, the figure of Britannia, supported on each side by a lion, and above a wreath of oak leaves, surmounted by a crown, illumined by descending rays, with a foliage border on the sides and bottom, richly elaborated. This is the first attempt in this country to make a texture of entire Alpaca, the usual mode adopted being to mix it with a cotton warp, for cheapness, and a silk one when the object is superiority.

2nd. A copy of the above, with a scarlet silk warp, and forming a gorgeous contrast.

3rd. Mr. Gregory next presented a striped and figured dress, or cloaking, 12 yards, the warp rose-coloured thrown silk, spun to a fine number and doubled, and the weft Alpaca. The figure represents the rose, shamrock and thistle entwined, on alternate grounds of black and red. In this piece 2½ lbs. of Her Majesty's fleece were expended, the effect rich, chaste, and classic.

4th. Mr. William Fison offered the next specimen, viz., a plaid dress, 15 yards, and containing 2½ lbs. of the original wool, warp rose-coloured spun silk, weft Alpaca, checked with ruby worsted, and a few threads of white cotton, to complete the square. This specimen was admired as an exemplification how much the tartan texture is improved by the introduction of Alpaca.

5th. A plain black Alpaca lustre dress, 16 yards, and containing 3½ lbs. of the Windsor fleece, the warp fine cotton twist, and weft Alpaca. His Royal Highness seemed particularly struck with the fineness, softness, lustre, and pliability of this piece, and on the effect therein produced, was pleased to bestow the highest encomiums.

It was explained to His Royal Highness that, in consequence of the colour of Her Majesty's Alpaca fleece being natural, and not imparted by any artificial process, no chemical action could touch and deface it; a fact with which His Royal Highness seemed perfectly well acquainted. Specimens of Alpaca yarn, spun by Mr. James Whitley, were next submitted to His Royal Highness, showing the great improvement made at Bradford in this stage of the manufacture. It should here be remarked, that the French excel us in spinning short wools, while we surpass them in long ones. The fibre of Alpaca frequently extends to 12 inches. There is, consequently, a peculiar art in spinning it; but the process has at length been brought to such perfection, that the yarn reaches No. 60, that is, 60 hanks to the pound, each hank being 560 yards long, so that 1 lb. is spun to the length of more than two miles. Owing to its lustrous quality, and the fibre being closely knit, great difficulty was at first experienced in giving to the white a bright and durable colour. This difficulty has also been overcome, and good blues, orange, brown. &c., are produced.

His Royal Highness expressed himself much gratified with the textures, and complimented the manufacturers on the skill and ingenuity with which they had severally executed the task taken upon themselves. After partaking of refreshments, the party, including Mr. Thomas Southey, left the palace, deeply impressed with a sense of the high honour conferred upon them, and at the same time filled with admiration at the affability and condescension which His Royal Highness displayed on this occasion, as well as the interest and intelligence with which he inquired into the various stages of this new branch of manufacture.

The 12th instant was a proud day for Bradford, and as such the local papers loudly proclaimed it. It is equally a subject of exultation to every true-hearted Englishman, that royal patronage has, under such peculiar circumstances, been bestowed upon a new texture, which, on account of its beauty, cheapness, and more especially its durability, bids fair to come into very general use, both at home and abroad—a texture in which the Peruvian Incas, their wives and daughters, were for ages clad. Nothing cramps this growing trade but the high price to which the raw material has risen. When first introduced it sold at 8*d.* to 9*d.* per pound, whereas at present white sells for 2*s.* 8*d.*, and black and coloured 2*s.* 3*d.*. In 1834, we imported 5000 lbs.; but for the last four or five years all that could be procured in Peru has been regularly brought over, and the amount has not even reached two millions of pounds per annum. Is not this, then, a sufficient reason why our patriotic men—those who wish to befriend our suffering manufacturers, should endeavour to people our hills with an animal affording so valuable a fleece, now that it is proved to be so admirably well suited to our soil and climate—nay, that the wool improves with our pastures[a]. This is the only means of rendering the consumers independent of a precarious and inadequate supply, and at the same time preventing those adulterations to which a scarcity of the article naturally leads.

I am, Sir, your obedient servant,
WILLIAM WALTON.

December 21, 1844.

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[a] For a review of, and extracts from, Mr. Walton's new work on the Naturalization of the Alpaca in the British Isles, vide our No. for September last. ED.

SCULPTURE.

Walks through the Studii of the Sculptors at Rome. By Count HAWKS LE GRICE, Chamberlain of Honour to his Holiness the Pope. Rome. Monaldini.

THE studios of the Roman sculptors are not the least interesting objects which the Eternal City presents to the traveller, and they ought to be visited by all who take an interest in the advancement of art, both on account of the works of high merit which they contain, and because they afford opportunities of judging of the real state of sculpture throughout Europe. Within a small compass there are congregated together a number of enthusiastic artists from all nations, living in the bands of a common brotherhood, and remarkably free from those petty jealousies with which men are apt to look upon those whom they may consider their rivals in the pursuits of life. Rome is well known to possess peculiar facilities for the study of the fine arts. Its collections are altogether unique. Apart from the number of the highest works of antiquity which they contain, there is such a variety of separate studies of almost every description, scattered throughout its vast museums, that no diligent student can even walk through them without learning something which he may turn to account. Then, again, there is perhaps no city in the world so rich in living models. The ancient Latin tribes still furnish to the artist some of the most perfect of human forms. These advantages, in addition to the rank in society which the artist occupies, and the facility with which his well-earned fame may be spread abroad by the continued succession of visitors, who resort to Rome from all quarters of the world, make the Eternal City the most desirable residence of those who wish to take a high rank in their profession.

In walking through the more retired streets of the city, we not unfrequently encounter large blocks of marble, placed on either side of the doors of what at first sight might appear an ordinary workshop. On pàssing the threshold, however, where you are always politely received, either by the sculptor himself or one of his workmen, you see before you a number of statues, bas-reliefs, or busts, in all stages of progress, from the rough, damp, clay model, to the most perfectly finished work of art. These are sometimes seen of all sizes, from minute marble copies, a foot in height, up to the colossal size of twenty or twenty-five feet. Amongst the works of forty-six resident sculptors, there must of necessity be a great variety and degree of talent displayed. This variety exists even in the works of individual artists. There is little that is not deserving of some notice, while there is a great deal that is excellent.

Winkelman has divided Greek art into four styles: the ancient, which preceded the time of Phidias; the grand, which took its origin with that great sculptor; the beautiful, introduced by Praxiteles and Lysippus; and the imitative style, which was copied from the others. If we might be permitted to adopt a somewhat similar classification of the styles of the modern Roman artists, we should divide these into, classic, religious, and natural. The restoration of the classic art is due to Canova, and to his great successor Thorwaldsen. In some of the works of the former, as, for instance, in the famous group of the Graces, at Munich, the classic feeling is developed in a high degree. But, in many of his works, Canova seems to have had to struggle against a certain kind of sensualism, which has obscured their beauty, and impaired their ideality. From this blemish Thorwaldsen appears to have been entirely free. Many of his classical conceptions are beautiful and pure, while others are marked by the elements of naturalism, which seems peculiar to northern sculpture. Thorwaldsen is now, alas! no more; but he has left behind him, in our own John Gibson, a successor whose merits are of the very highest order. Perhaps there is no living artist who can infuse a feeling so thoroughly classic into his subjects, particularly in bas-relief; and it has been truly said of him that he has frequently excelled in drapery, finish, and artistic execution, some of the admired works of ancient Greece. Gibson possesses not only a correct imitative faculty, but he seems to have the rare power of thoroughly grasping his subject, and reproducing it in a highly idealized form, so that his works please equally by their beauty and intellectual development.

The true office of sculpture is not to copy any form, however beautiful, but to exhibit the ideal type which the artist has conceived in his own mind of any particular character or event. It is quite clear, therefore, that in order to accomplish this, he must live, as it were, in his subject; he must study it under every aspect; he must bring his mind into perfect conformity with it, and then an accurate knowledge of the mechanical department of his art will enable him so to embody his conceptions that they will command the responsive admiration of all similarly constituted intellects. It was in this way that the ancient sculptors attained to such mastery. The quick and ardent temperament of the Greek, with its rapid power of perception, enabled him to enter with enthusiasm into the most minute shades of character which his work was intended to display; and when we take in connexion with this, the fact, that by far the greater proportion of these works gave expression to his religious feelings, we arrive at an adequate explanation of the marvellous and as yet unequalled excellence of the sculpture of that era. That religious system has long since passed away, and with it no doubt much of the feeling with which an ancient worshipper would have looked on the master-pieces that still adorn the galleries of Europe; but there is in classic art an element connecting it with the beautiful in nature, which will ever make its study one of the most refined pleasures of a cultivated mind.

The gradual decline of Paganism was, perhaps, a chief cause of the decline of classic art. A new and purer faith had slowly and silently pervaded the whole mass of European society. The ancient religious system was either believed to have been a monstrous fable, or the delusion of evil spirits, and the graceful embodiments of its mythology were looked upon as the residence of demons, which it was a virtue to destroy; so that not a single statue has come down to us which has not been mutilated by the hammer of the Iconoclast. Even after the establishment of Christianity, however, as the religion of the state, the artistic spirit appears to have struggled for existence, and early attempts were made to render it subservient to the illustration of Christian truth. In the reign of Theodosius the Great, Pacatus advises the emperor to "let ingenious artists consecrate their art to sacred subjects, and lay aside the fables of the ancients. Let them engrave," says he, "in their temples and forums on ivory and marble, and paint in vivid colours the truths of revelation." It was long after this period that religious art developed itself in attractive forms. The earlier efforts were, many of them, of the very rudest character, and contained no one element in common with that which had passed away apparently for ever. Christianity appealed to feelings far deeper than those from which the old religious system had sprung. The new life which it infused into the whole spiritual being of man, the seriousness with which it invested all occupations, and the awful responsibilities of an unseen and eternal world, did not naturally ally themselves to forms of external beauty. The rudely carved crucifix, or the still more unshapely image of the patron saint, were the only representatives of Christian art for many ages. No circumstance could more completely prove the utter decay of Greek sculpture than the fact, that the most deeply interesting of all possible subjects should have been for so great a length of time divorced from every element of either grace or beauty. In the great struggle that was going on in the world, the simple expression of religious emotion appears to have been all that was aimed at, while the forms themselves were studiously rendered different from those which distinguished the Pagan mythology. And yet, as Count Le Grice well observes, "Sacred subjects are far more favourable to the grand in sculpture than even the most felicitous inventions of mythology, or the sublimest creations of uninspired poetry. The reality with which religion invests every thing, the lofty moral which it inculcates, the deep pathos which it breathes, awaken and enlist the strongest emotions of the heart, whilst the unequalled grandeur of the great events which it records, presents to the pencil of the painter and the chisel of the statuary, objects upon which to exercise their powers so transcendent and unearthly, that the most soaring genius could never have caught a glimpse of them even in his loftiest flights. The severity and dignity too of sacred subjects, are most congenial to the grave character of sculpture, which disdains the littleness of the ignoble themes to which it is sometimes prostituted by venality or corrupt taste." At the period of the revival, the recovered remains of classic antiquity very soon exercised a powerful influence, which has been increasing to the present time.

Thorwaldsen excelled in religious sculpture; no one knew better than he how to invest the most solemn subjects, with beautiful external forms; and at present the palm must be yielded to Tenerani, who, along with Galli and Hogan, occupy the first place in this department of the sculptor's art. Perhaps no religious subject more touching was ever executed than Tenerani's great bas-relief of the Descent from the Cross, which has been recently finished for the Duke of Torlonia's chapel; but his chef d'œuvre is, beyond all doubt, his colossal statue of the Angel of Death, a work of extraordinary power. The figure is represented in a sitting posture, the hands resting upon the knees on a scroll and trumpet. The countenance is of the most angelic beauty, but expressing all the dignity and solemnity of the awful vocation from which he appears to have rested but for a moment. It is a religious work in the highest sense of the term, and yet it is adorned with a thoroughly classic grace. Before this statue was completed, its effect was very fine; it looked like a great stone shadow of some dread object, gradually bodying itself before the sight. Unfinished sculpture, indeed, seems best adapted for the expression of certain ideas. No one can look upon the Titanic figures of Morning on Michael Angelo's tombs of the Medici at Florence, without being strongly impressed with the fact, that the rough shade, wakening up as it were into a more perfect form, adds greatly to the expression which the artist intended to convey. Religious sculpture is decidedly on the advance at Rome, and bids fair to surpass all that has been hitherto achieved.

The application of this branch of the art to monumental designs, has been recently carried to considerable perfection. Nearly every studio presents one or more specimens, either completed, or in progress. Unfortunately the artist is not always left to the inspirations of his own genius, but his resources are crippled, and his aim perverted, by the ignorance or the vanity of the parties with whom he has to deal. We have seen immense labour and skill bestowed on bas-reliefs, especially whose subjects and manner of treatment has been contracted for in such a spirit as to leave the artist no alternative but the rejection of a lucrative engagement, or the absolute disgrace of his art. This is a circumstance very much to he deplored, and for which there appears to be no remedy, except a more widely spread and correct taste amongst the public at large. There are, however, individuals and committees enlightened enough to give the sculptor credit for more knowledge of his profession than they themselves possess; and there are consequently to be found works of high character, exhibiting all the excellences of a classic style, combined with deep religious sentiment.

In the church of St. Carlo in Corso, in Rome, a monument, by Gnaccarini, has recently been erected to the memory of Lorenzo and Serafina Mingaccio, which exhibits many excellences, whether we regard the purity of its architectural design, or its admirable sculptural decoration. The entablature is supported by four Corinthian columns, between which are placed statues of Faith, Hope, and Charity. The design and execution of these statues is exceedingly beautiful, and the drapery well managed. On the attic is a bas-relief, consisting of nine figures, which tell the story in an affecting manner. The spectral form of Serafina, shrouded in a mantle, who died six years before her husband Lorenzo, appears at the door of the sepulchre to welcome him to the mansions of the dead. He seizes her by the hand, while he turns towards his son, who died three days after him, and who is represented as holding the mantle of his father. The other figures exhibit the surviving members of the family. Gnaccarini has utterly discarded in this monument the detestable modern costume as altogether unsuited for his purpose, and has draped and grouped his figures in a most effective manner.

What we have called the natural style of sculpture is at present by far the most extensively pursued. It seems to have originated with the German artists, and to be nothing more than a simple expression of a certain peculiarity in the German mind, which is one of the simplest and most unsophisticated in Europe; and a degree of what may be called naturalism pervades all the best productions of the national literature. The sentiment may be considered as the opposite of the heroic, and it leads them to view every subject in a light almost peculiarly their own. It is not to be wondered, therefore, that when the sculptor attempts to embody a classic conception, it should partake of the tinge of his own mind. The works of the German artists are, generally speaking, of a high character. There is great freedom and richness of design; their forms are particularly good, and on the whole they may be considered as eminently successful in the development of subjects; but there is a want of generalization and a deficiency of that grace which gives a charm to classic sculpture. Any one, after studying

Gibson's beautiful statues of the Hunter, and Cupid disguised, will be particularly struck with the naturalism in the character of German sculpture on visiting the studios of Troschel or Steinhauser. The Perseus of the former, and the beautiful group of Hero and Leander of the latter, afford abundant evidence of the high degree of excellence to which these artists have attained. The modelling in both is extremely good, and exhibits great ease and expression; but still the eye at once recognises that the subjects, though classical, are not rendered in a true classic spirit. The style of both artists, however, is admirably adapted to works of another class, in which a single idea has to be portrayed.

In the same studio with the Perseus, is a statue of a young girl asleep; and alongside of the Hero and Leander there is an exquisite figure of a child listening to the sound of a sea-shell, both of which are just as pleasing productions as one would wish to see. Nearly allied in style to these is a charming statue of a Greek slave sculptured by Mr. Power, an American artist residing in Florence, whose works are not so extensively known as their merits deserve, but who bids fair to occupy a high position in his art.

In the execution of busts, the classic has a decided preference over the Iconic or natural style. This circumstance was perfectly well known to the ancient artists, who in their best works always gave an idealized likeness, which appears to have contained in it not only a representation of character, but also the family type of the original. It was stated by Posidonius that the descendants of Brutus were to be recognised by their resemblance to the statue of their ancestor, yet we know from existing remains that the likenesses were idealized.

Count Le Grice's work contains many excellent remarks on this subject. He says, "The perfection of the sculptural art does not consist in making the bust of any one a faithful transcript of every feature of the face, but in giving to the whole the general effect of the individual portrayed, and not an absolute mechanical copy of every peculiarity which presents itself to the eye or touch. To generalize is to omit all incidental details; and to modify is to give the features a more perfect type than they in reality possess. By such means the expression is rendered more exalted than the living model, and the features are beau-idealized without losing the likeness."

A thorough mastery of these rules is essentially requisite for the bust sculptor. Both styles are practised at Rome as well as elsewhere; but the classic, as we have already said, has a very great advantage over the Iconic. This may be easily illustrated from a well known work of Canova. The head of Pope Clement XIII. on his monument in St. Peter's, is universally allowed to be the finest Iconic bust in the world. It exhibits every detail in the model, and when closely inspected, has a degree of perfection that is quite wonderful, but from a distance its effect is by no means striking.

In the modelling of idealized busts no artist of the present day excels Macdonald. His likenesses are invariably good, and the character of his subject is rendered with great force, as well as with true classic taste. His studio contains a collection of casts of nearly all his works, and attracts numbers of visitors.

It is impossible to give more than a very general view of Roman sculpture within our present limits; but still it would be an act of injustice to pass over such names as those of Bienaime, Fabris, Wolfe, Laboureur and Wyatt, all of whom have produced works of superior merit. There is a gigantic group of Milo, of Crotona, twenty-five feet in height, at present in the studio of Fabris, which we shall notice on account of its magnitude, and the felicity with which so large a subject has been handled. "The moment chosen by the artist is when the hands of Milo were caught in the cleft of the tree, and a huge lion, finding him in that defenceless position, has sprung on the captive Athlete, and is in the act of lacerating the muscle of his thigh. In this awful situation the efforts of the surprised Crotonian to disengage his hands and defend himself are truly terrific; every member of his Herculean frame is strained to its utmost tension; and his turgid muscles and swollen veins give fearful indications of his wondrous strength, and cruel agony of mind and body. Although affliction and dismay are fearfully depicted on his agonized countenance, the eye-balls seem to roll in wrath and vengeance; and we read in his lowering brow his wild and despairing defiance. His grizly hair and beard stand erect with horror, whilst his parted lips and convulsed tongue seem thundering forth cries of wild rage and terror. His giant proportions, thus struggling in vain to defend himself against the ferocious king of the forest, whose strength is here exercised with impunity on an unresisting foe, strikes the beholder with that "delightful horror," which, according to Burke, in his "Treatise on the Sublime and Beautiful," is the true characteristic effect of the sublime!

The figure is supported by the stump of the tree, which proves fatal to Milo; from it hangs the skin of the young bullock, the first trophy of his strength; and on the ground are the wedges that fell from the cleft of the tree, and caused the fatal accident. The lion is portrayed with terrific truth: his claws are deeply buried in the flesh, and the gushing blood-drops are seen trickling from the wound. The lion's mane stands erect, and his tail seems to lash his sides with triumphant energy and ruthless rage.

. In the naked proportions the artist has displayed an intimate acquaintance with the muscular development of the human frame; the left leg and the toes grappling the ground are graceful and natural; and the hands are in the style of Michael Angelo. The conventional treatment of the hair and beard produces a fine softened effect of light and shade; there is a breadth and boldness throughout the whole that accord admirably with the character of the group; and we have no hesitation in saying that, placed on a pedestal, and seen against the dark blue sky as a back-ground, this colossal group would prove singularly imposing."[a]

The restoration of the magnificent church of St. Paul, which is now proceeding, has afforded opportunities to several of the Roman sculptors for exhibiting their skill in decorative statues. These are marked by certain peculiarities which are distinctive of this particular kind of sculpture. The dimensions of the edifice, and the position which the work is to occupy, as well as the direction and amount of the light, have all to be taken into account.

It is stated by Rollin, that "Phidias was not one of those artists who only know how to handle the tools of their profession; he had a mind adorned with all the knowledge that could be useful to a man of his profession, of history, poetry, fable, geometry, and optics." Phidias and Alcamenes once contended in the production of a statue of Minerva, which was intended to be placed in a public situation. The two statues were accordingly finished and exhibited to public view. The Minerva of Alcamenes, from its exquisite finish, gained all the suffrages of the people; that of Phidias, on the contrary, was unanimously rejected on account of its great mouth, distended nostrils, and apparently deformed visage. Phidias requested that both statues should be placed alternately in the situation which the successful one was intended to occupy. The contrast between the two was then sufficiently striking. The Minerva of Alcamenes was now thought insupportable, while the other had such an air of grandeur and majesty as to excite universal admiration. This anecdote illustrates the necessity of attending to those conditions which are incidental to decorative sculpture. It requires great breadth and massiveness of style, as well as great art in ths distribution of its lights and shadows.

Laboureur has executed a fine statue of St. Gregory the Great, eleven feet eight inches in height, which is intended to be placed in the church of St. Paul. In the studio it appears coarse and not over well designed; but from the artist's known ability there can be little doubt that it will show to great advantage when it is placed on its pedestal.

We may refer incidentally to the cutting of cameos, as a branch of Roman art which has recently undergone very considerable improvement. In this department Saulini has taken the lead, and an examination of his works will easily show that they admit of design and finish similar to that of the best bas-reliefs. One cause of this advance has doubtless been the practice of making cameos simply reduced copies of larger works, but Saulini has also a high degree of talent as an artist, and can render his subject with a degree of spirit akin to that of the original.

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[a] Count Le Grice, *op. cit.*

On the whole, we are disposed to consider the present state of sculpture as highly satisfactory. It is true, that there are no living artists whose works, individually, can be put in competition with those of Canova or Thorwaldsen; but at the same time there is a much larger number of men of talent devoted to the art than at any former period. Almost every nation has one or more representatives of great promise, especially among the younger artists. A correct taste is more widely spread than it has hitherto been, and the study of classic antiquity is pursued with more ardour. Count Le Grice's work, which has led to the preceding observations, is an important auxiliary to the progressive movement which is taking place. To a competent classical knowledge he unites an enthusiastic admiration for the Greek art, and possesses a thorough insight into its principles. His criticisms consist rather in pointing out excellences than in denouncing faults; perhaps to do both would be productive of the greatest amount of good, but situated as the Roman artists are, it is no easy matter to correct imperfections, without inflicting injury on their private interests. He seems to prefer passing over the bad without notice of any kind, while what is really good is dealt with in a friendly and liberal spirit.

The Law a Rule of Life to the Christian. By the Rev. Charles Smith Bird, M.A. F.L.S. Cleaver.

This volume consists of eleven lectures on the Decalogue, preached in the parish church of Gainsborough. They are carefully and elegantly written. They abound in truths ably delivered, and are likely to produce an impression upon their hearers, for those who read must feel that they are the offspring of pure devotion and of heartfelt sincerity. The dedication to Dr. Kaye is well expressed, and is evidently a tribute of respect to a disinterested patron who bestowed a living upon the author, who was known only to him by the good he had done. The Bishop of Lincoln evidently did right in drawing the reverend author from the seclusion of a retired curacy, and placing him in the midst of a numerous population where he will employ his opportunity for doing that which is good and just.

WHAT IS POETRY?

Imagination and Fancy; or, Selections from the English Poets, illustrative of those first Requisites of their Art; and an Essay in Answer to the Question "What is Poetry?" By Leigh Hunt. Smith, Elder & Co.

If any of our readers should feel disposed to question the propriety of our diversifying the gravity of our usual contents by a reference to those of the elegant "monster-green" and silver bound volume before us, let us endeavour to find an apology in a passage from the author's own essay, in answer to this question, "What is Poetry?" Poetry begins when matter of fact or of science ceases to be *merely such*, and to *exhibit a further truth;* that is to say, the connexion it has with the world of emotion, and its power to produce imaginative pleasure. Inquiring of a gardener, for instance, what flower it is we see yonder, he answers "a lily." This is matter of fact. The botanist pronounces it to be of the order of "Hexandria Monogynia." This is matter of science. It is the "lady" of the garden, says Spencer; and here we begin to have a poetical sense of its fairness and grace. It is "the plant and flower of *light*," says Ben Jonson: and poetry then shows us the beauty of the flower in all its mystery and splendour. If it be asked, how we know perceptions like these to be true, the answer is, by the fact of their existence,—by the consent and delight of poetic readers; and as feeling is the earliest teacher, and perception the only final proof of things the most demonstrable by science, so the remotest imaginations of the poets may often be found to have the closest connexion with matter of fact; perhaps might always be so, if the subtlety of our perceptions was a match for the causes of them. Consider this image of Ben Jonson's—of a lily being the flower of light. Light undecomposed, is white; and as the lily is white, and light is white, and whiteness itself is nothing but light, the two things, so far, are not merely similar, but identical. A poet might add, by an analogy drawn from the connexion of light and colour, that there was a "golden dawn" issuing out of the white lily, in the rich yellow of the stamens. I have no desire to push this similarity farther than it may be worth. Enough has been stated to show that, in poetical as in other analogists, "the same feet of nature," as Bacon says, may be seen "treading in different paths;" and that the most scornful, that is to say, dullest disciple of fact, should be cautious how he betrays the shallowness of his philosophy by discerning no poetry in its depths." Again Bacon in another part of his writings, says, talking of men's various studies;—"Histories make men wise, poetry *witty*," (which means not *punsters*, but of active perception,) "the mathematics, subtle, &c." and adds, "there is no stand or impediment in the act but may be wrought out by fit studies."

Enough then, perhaps, to establish poetry, *good* poetry, as part of the wisest man's studies. But the question is, in what consists good poetry, and where to find it? To know the former point, one must have studied the matter as a profession; to know the latter, one must have read all poetry, good and bad, and separated them to the right and left. It is the want of time to pursue this course of study, and to make this selection, that has so restricted the knowledge and enjoyment of the works of the poets amongst men of the profoundest thought and most active talent. Homer, Shakspeare, and Milton, are so supremely excellent in their respective styles, and are so universally acknowledged to be so, that a man has no difficulty in falling back again and again upon them, every time he becomes nauseated with the namby-pamby trash of mere versifiers, which he may have taken up at hazard. And the consequence of this is, that discouraged with repeated disappointments of this kind, and being loath to court further offence and annoyance in the same way, the man of mind, but of occupation, is often apt to "swear by" Homer, Shakspeare, and Milton as his three only poets, to the exclusion of much of real poetry which really exists in others.

To a man so circumstanced, a caterer and a pioneer, like Leigh Hunt, who was born, if not a poet, at least with a lively perception for poetry within him; who has through life cultivated the innate impulse as a passion, and fed its craving with all that poets ever produced, both in our time and in times of yore, must be invaluable. True we may not always agree in all his opinions on matters of taste, but we must always admit that he advances reasons for his likings and dislikings, and by virtue of these reasons, we are at liberty to participate in them or not.

Mr. Hunt starts with a general essay in answer to the question, "What is Poetry?" an essay which, in seventy pages, gives us a broader view of the realms of poetry, and of its diversified attributes, illustrated by a more abundant reference to examples from all the chief poets, ancient and modern, than we should have conceived to have been possible within any thing like the compass. The remainder of the volume is then occupied with extracts, well selected, well read, well italicised in their remarkable lines, and well commented upon from Spencer, Marlowe, Shakspeare, Ben Jonson, Beaumont and Fletcher, Middleton, Decker, and Webster, Milton, Coleridge, Shelley, and Keats. If the reader be astonished at the gap of above a century between Milton and Coleridge, he should bear in mind, that the present volume pretends only to illustrate poetry in regard to "those first requisites" of the art, "Imagination and Fancy;" and in these points the author, doubtless considers the poetry of the eighteenth century deficient. Yet still, by his own showing, in a passage in his Essay, we think that Chaucer and Pope should have been included, if in ever so small quantities:—"Spencer," he says, "has great imagination and fancy too, but more of the latter; Milton both also, the very greatest, but with imagination predominant; Chaucer, the strongest imagination of real life, beyond any writers but Homer, Dante and Shakspeare, and in comic painting, inferior to none; Pope has hardly any imagination, but he has a great deal of fancy; Coleridge little fancy, but imagination exquisite; Shakspeare alone, of all poets that ever lived, enjoyed the regard of both, in equal perfection." After reading this passage, we certainly feel disappointed not to find Pope in his place before Coleridge, to illustrate the marked contrast which our author makes between them. The omission is the more remarkable, as in the Essay, the Rape of the Lock is referred to as a brilliant example of fanciful poetry. We may add, however, that it is intended, should the present volume be well received by the public, to follow it up with others, respectively allotted to the poetry of action and passion, of contemplation, of wit and humour, and of song or lyrical poetry;—and that in one or other of these, it is possible Pope may find a place.

We would gladly take up discourse with Mr. Hunt on many of the points of principle and criticism with which he, as it were, lays open the elements of his subject. But we must restrict ourselves to two or three. Our first quotation is a bold defence of what matter-of-fact men are apt to look upon as a vulnerable province in the world of poetry; namely, the supernatural. Hobbes, who Mr. Hunt says, "translated Homer, as if on purpose to show what execrable verses could be written by a philosopher," alluding to the writings of Spenser and Ariosto, said that "impenetrable armours, enchanted castles, invulnerable bodies, iron men, flying horses, and a thousand other such things, are easily figured by them that dare." To which Mr. Hunt replies; but "enchanted castles and flying horses are not easily figured *as Ariosto and Spenser figured them; and that makes just the difference;*" and then, after some examples in point, goes on:—"Hobbes, in making objections to what he thought childish, made a childish mistake. His criticism is just such as a boy might figure himself upon, who was educated on mechanical principles, and thought he had outgrown his Goody Two Shoes. With a wonderful dimness of discernment in poetic matters, considering his acuteness in others, he fancies he has settled the question by pronouncing such creations impossible! To the brazier, (alluding here to Chaucer's Steed of Brass,) they are impossible, no doubt; but not to the poet. Their possibility, if the poet wills it, is to be conceded; the problem is, the creature being given, "*how to square its actions with probability, according to the nature* *assumed of it.*" In a word, if we may be permitted to add anything to what is already so well done to our hand, Hobbes did not, or would not, consider the applicability of logical reasoning to the most extravagant hypothecated case.

We agree also with Mr. Hunt in decrying the existence of "prose poetry." We consider it at the best to contain the essence of poetry, but not in the form of poetry. Musical cadence, the beauty of smooth versification and appropriate accentuation, are necessary to the conveyance of a poetic idea, from the mind of him who imagined it, to another. An abstract poetic idea may exist in the mind of a poet; but as soon as he attempts to give it utterance, he must, if he be a poet indeed, give it an appropriate poetic shape. Hence versification is a distinct test of poetic merit. "Weakness in versification," says Mr. Hunt, "is want of accent and emphasis. It generally accompanies prosaicalness, and is the consequence of weak thoughts," or, if we may add, a deficient appreciation of the subject in a poetical point of view. In another passage, after referring to the "variety in uniformity," which masters the versification of Coleridge, (in Christabel for instance), he says:—"*It is thus that versification itself becomes part of the sentiment of the poem.*"

In all this, and much more that Mr. Hunt writes, we entirel agree, and so we might part friends. But as we love and long to be critical, we must indulge in a little touch of the sort by way of a relish after repast. If poets ought to be strictly accurate and consistent in their figures and similes, so as certainly ought those who criticize their performances. Yet have we not a slip, or "Irishism," here at page 50? where, speaking of the heavy uniformity which disfigures the metre of Pope's Rape of the Lock, he says:—"The reader will observe, that it is literally *see-saw*, like the rising and falling of a plank, with a light person at one end, who is *jerked up in a briefer time*, and a heavier one, *who is set down more leisurely at the other.*" The idea intended here may be guessed at, but it is certainly not accurately expressed. If Mr. Hunt had studied the mechanical power, as he has those of poetry, he would have known, that although the two ends of a lever moving round a fulcrum may be unequal, one end cannot stop before the other, and that the long end through it may travel up faster than the short end travel down, does not arrive at its destination "in a briefer time."

This little hint may, perhaps, restore the self-complacency and good-humour of our more practical readers, who may have been wondering how far we were going to wander into the realms of figures and fancy; and with it we commit this little volume to their favourable consideration.

Christmas Festivities for 1845, by JOHN POOLE, Esq. Smith, Elder & Co.

The Comic Miscellany for 1845, by JOHN POOLE, Esq. Henry Colburn.

SURELY the force of invention, and the art of book-making "can no farther go." Two Comic Annuals for 1845, by John Poole, Esq., and yet no line written for, or in behalf of either of them, by the said John Poole. This may seem to require explanation;—it has the sound of a decided paradox. It is, however, strictly true;—and it is also strictly correct to say that both the above attractive titles are misnomers:—not to use any harsher term. Mr. Macauley, and Lord Jeffrey have reprinted their articles from the Edinburgh Review, and there is no reason why Mr. Poole should not reprint his from the New Monthly Magazine, if he fancies that there is a demand for them. But in all fairness and reason, let them be put before us for what they are;—"Tales and Essays, by John Poole, Esq., reprinted from the New Monthly Magazine;"—not for what they are not, and never were contemplated to be, "The Comic Miscellany," and "Christmas Festivities,"—"*for* 1845." The misunderstanding between Mr. Poole and Mr. Colburn, out of which it arises that we have two works so nearly similar in title, is developed by "Notices to the Reader," --pasted in as an after-thought after the title pages of the respective books. Mr. Poole who came out first, alleges that Mr. Colburn had no right to publish "The Comic Miscellany," and to use his name as the Author, alleging that Mr. Colburn has "nothing new" of his (Mr. Poole's) in his hands; and that therefore the said Miscellany can only possibly consist of reprints from the New Monthly Magazine. All this time Mr. Poole overlooks the fact that his "Festivities" have nothing new in them either, being also reprints from old "New Monthlies." Mr. Colburn, however, defends his right to do what he likes with his own, having paid Mr. Poole for the Articles, and so the matter stands. The public of course have a right to buy both of these "attractive" Annuals if they please;--but in spite of their smart crimson and salmon cotton bindings, their handsome portraits, and so forth, we do not think they will be tempted to do so after reading this notice.

The Confessions of the Ideal, and other Poems. By THOMAS POWELL. C. Mitchell, 1844.

AMONGST the ardent spirits of the present day who have striven to keep alive in us the passion for sweet song, the writer of the little volume before us has not been the least industrious nor the least successful. There is a genuine spirit of poetry about him which cannot be mistaken, and will not brook control. With a quick perception for the beautiful and the amiable, he has a ready fancy, and a happy aptitude for harmonious forms of phrase. The consequence is, that he has written many beautiful things in various styles of poetry. His tragedies, particularly "The Blind Wife, or the Student of Bonn," and "The Shepherd's Well," possess considerable merit of invention, and character, though, perhaps, hardly put into that concentrated and artistic form which would adapt them for representation. "The Confessions of the Ideal," in the present volume, are a succession of "phantasies," which have crossed the author's mind at various fitful times, reflections upon life and nature—now grave and sad—now bright and cheering as the splendid morning sun. Apart from the consideration of their poetic merit, and their propriety of sentiment, they have this great recommendation, the total freedom from affectation.

Urinary Deposits. By GOLDING BIRD, M.D., A.M. John Churchill.

THIS subject, in connexion with Agricultural Chemistry, has lately been the theme of much inquiry. The labours of the indefatigable Liebig have been directed towards the elucidation of the analysis of the secretions from the kidneys. The physical and chemical character of the excretions that are poured forth, have been examined by Dr. Bird, in reference to the most important subject that can occupy the attention of man, namely, the prevention and cure of the diseases to which we are subject; and he has performed this task he has assigned to himself, so as to derive, not only the approbation of the public, but the rewards that the skilful physician generally obtains. His book contains a digest of the best opinions entertained on the diagnosis, pathology, and remedial treatment, of the most sensitive organs of the human body, with his own close observation, and the results of several years of experience. The investigation of the excretory system, or those structures by which both the superabundant food taken into the stomach, and the fibres no longer capable of forming a part of the human body are expelled, belongs to a department of medicine which derives much of its information from Chemistry. But, generally speaking, Physiologists have paid till lately but little attention to this great source of their arrival at truth; and we are happy to see Dr. Golding Bird, who unites both of these studies, devoting his attention to the points which are embraced by these sciences, and likewise that he seeks microscopic aid, from which so much is to be expected, although as yet so little has been revealed to us. If we do not enter upon an analysis of this work, it is not from a feeling that our readers would not appreciate it, but from the conviction, that to do justice to it, we should be called upon to make considerable extracts from it, which, in the present circumstances, we are compelled to avoid; but in many of our researches we are persuaded we shall have to quote, as our authority, Dr. Golding Bird's work, which contains a mass of materials connected with what may be termed vital chemistry, from which we shall have occasion to draw, when illustrating any points connected with the subject he has so ably handled.

Minutes of the Proceedings of the Institution of Civil Engineers.

THE council of this society has adopted the plan of publishing the proceedings of each evening, together with the papers read. The communications are given in a complete form, with such illustrations as are necessary to explain the views of the authors. When the volume is finished, with its index, we shall more immediately examine its contents, but we cannot allow the opportunity to escape us of making some observations on the admirable plan upon which the meetings are conducted, and upon the satisfactory results of the zeal which civil engineers are exhibiting in promoting the advance of the different sciences which are auxiliary to their own department. We notice with pleasure that discussions upon the matters contained in the communications, are carried on, and that they elicit a mass of important information. The parent societies, the Royal and the Antiquarian, are distinguished for exceeding dulness, and for an exhibition of the drowsiness and carelessness of its fellows. A dull tedious paper is quite as welcome as one replete with instruction and knowledge; it is read in a monotonous tone of voice, listened to with listlessness, and is forgotten, until it probably is looked at in the Transactions in which it is consigned to honourable yet permanent oblivion. The practice pursued in the Institution of Civil Engineers, and which is gradually finding its way into the best of our scientific bodies, of examining into the subject brought forward, and of expressing opinions, must tend to enlarge men's minds, enable them to convey ideas to each other, and to arrive at the great truths of science quickly and securely. On these occasions eloquence is not only unnecessary, but expensive, and the man least capable of expressing himself in the language of oratory, but of stating in simple words the result of his experience, or the ideas that have been awakened, will be listened to with the greatest pleasure. A brief outline of the discussion that has been elicited, follows in the publication of the minutes upon such of the communications as have been deemed of sufficient interest to require notice, or upon those that are more immediately addressed to the pursuits of those who are present. This plan is highly commendable, and we are persuaded tends to the public benefit. Among the sciences which civil engineers now embrace, is Geology, and it cannot but be considered very praiseworthy in them to assist that branch of knowledge by such observations as they are capable of making. We are glad to observe papers on peculiarities of geological position, and the description of such formation as have been met with in railroad making. We are pleased likewise, to observe, that the laws of chemistry are fully understood, and some of the investigations which are usually confined to the practical chemist, pursued with an ardour which must eventually produce the most favourable results. We are, indeed, satisfied that this institution is labouring with earnestness and with success towards the promotion of the general good.

THE EQUATORIAL MONUMENT.

Under the auspices of President Florez, has been completed a monument, which, though from the circumstances we are about to narrate, it is perfectly useless to science, is a proof that in the South American republics there will be found an anxious desire to cooperate with the scientific institutions of Europe in the promotion of any objects connected with the advancement of knowledge. Upon the plains of Yaruqui is now completed a pyramid, commenced in 1837, which bears the following inscription, and we are indebted to Colonel Wright, Consul-General for the Republic of the Equator, for the original documents, the representation of the stone, and for much information on the subject.

Geminam pyramidem
Monumentum Doctrinæ
Simul et grande adjumentum
Olim injuriâ temporum eversam
Vicentius Rocafuerte
Reipublicæ Æquatorialis Præses
Restituit
Gloriosæque instaurationes litteris consignandæ
Annuente consortium
Ludovico Philippo
Rege Francorum
Ornari conjunctis utriusque gentis insignibus
Jussi curavit.
Anno MDCCCXXXVII.

In the year 1735 the French and Spanish governments, for the purpose of determining the figure of the earth, sent out to the Equator a scientific expedition, to measure an arc of the meridian near the equator, and likewise some degrees of the equator. Only the former part of the intentions of the two governments was achieved. The trigonometrical observations of the expedition extended over three degrees of the meridian, from Quito to Tarqui, and occupied a term of four years, during which, from the great vicissitudes of climate between the intense cold of the most elevated peaks of the great cordillera of the Andes, and the burning heats of the plains of the tropical regions, added to the ignorance and prejudices of the natives, who in 1739, at Cuenca, rose en masse, clamouring for the death of the foreigners, whom they imagined had come out "to run away with their equator," all employed were exposed to a series of almost unparalleled fatigue, privation, and danger.

The expedition in question was composed of the French Academicians, Godin, Bouger, and La Condamine, to whom were associated by the Spanish government, two Spanish naval officers, already in South America, Don Jorge Juan, and Don Antonio de Alloa. The equatorial spot selected for their operations, was the province of Quito, in Upper Peru. At the period of the expedition's departure from France, it was a subject of deep regret in the scientific world, that no monument existed of the base which had served the celebrated Picard in 1672, for the admeasurement of a degree of the meridian between Paris and Amiens. Accordingly it was determined, that the two extremities of the base line of the expedition proceeding to South America, should be marked by two pillars or pyramids, with an inscription indicating the object of their erection.

Towards the end of the year 1736, in the plain of Yarougui, four leagues to the east of Quito, a base line with the greatest care was measured off; the operation required a month, the distance measured was 6272 French toises.

On its termination, La Condamine, in order to mark its two extremities, planted two *mill stones* in the hollow centres of which he set up two poles. From the great difficulty they had to encounter in the transport of materials, &c. &c., the construction of the pyramids was a service of much labour. On their termination, the following inscription was placed on their two inside faces. The northern pyramid was erected at Caraboura, and the southern at Oyambaro.

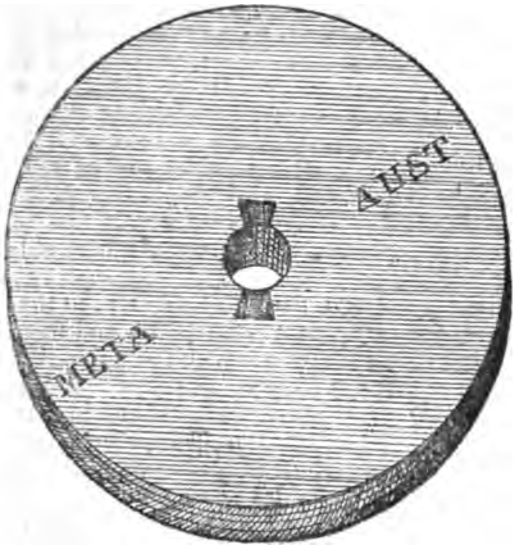
Auspiciis
Phillipi V. Hispanorum et Indiar: Regis Catholici
Promovente Regiâ Scientiarum Academiâ Paris:
Faventibus:—
Emin: Herc: de Fleury Sacræ Rom: Cardinali
Supremo (Europâ Plaudente) Galliæ Administro:
Cels: Jean Fred. Philipeaux de Maurepas
Regi Fr. a rebus Maritimis, etc., Omnigenæ Eruditionis Mecænate,
Lud: Godin.—Pet: Boguer. Car: Maria de la Condamine
Ejusdem Academ: Socii
Ludovici XV. Francor: Regis Chris: Jussu et Munificentiâ.
In Peruviam missi
Ad Metiendus in Æquinoctiali Plagâ Terrestres Gradus.
Quo vera Telluris Figura certius innotesceret
Assist: ex Mand: Regis Cath: G. Juan et Ant: de Ulloa Nav. Bell. Vice Pr.
Solo ad perticam libellamque exploratio.
In hac Varaquensi Planitiæ.
Distantiam Horizontalem inter hujus et alter Obelisci Axes.
6272 Hexapedum Pariss: Pedem 4—Pol: 7—
Ex Qua Elicietur Basis I. Trianguli latus Operi Fundamen.
In Linea quæ excurret a Borea Occidentem } Versus Grad.
Ab Austro ,, } 19 min. 25½
Ann. Christi. 1736 de Novembri.
Meta Borealis
,, Australis.

Previous to the opposition of this inscription, La Condamine submitted it to the two Spanish officers associated with them, who requested that all mention of their names might be omitted. Deeming that they had taken umbrage at the word *assistientibus*, he proposed to substitute the term *Concurrentibus*, or that of *Cooperandibus*. Both were equally declined. But Spanish pride had received a deep wound. Accordingly on the completion of the pyramids, La Condamine was cited to appear before the Audiencia Supremo de Quito, on a charge of having, without authority, set up an inscription; insulting the dignity of the Spanish nation. The gravamen of the charge consisted in the fleur de lys placed on the summits of the pyramids, and the mention of the names of the two French ministers. After much litigation, La Condamine got over the difficulty, by placing the Spanish crown over the fleur de lys, and by stipulating to leave a blank for the insertion of the names of the Spanish officers (the real casus belli) in the terms they might think proper. The work was therefore allowed to proceed, and on its completion, and on withdrawing the two poles from the centre of the mill-stones, which formed the basements of the pyramids, and left a vacuum equal to their diameters, La Condamine deposited in a leaden box, two copies of the inscription placed on the two faces of the pyramids, engraved on plates of silver, which he enveloped in a covering of palest sulphur and pounded tiles, which he dropped into the vacuum in question, and which by its own weight, would have fallen to the base. Two years after the return of the Academicians to France, the Spanish government gave orders to substitute a new inscription to that left by La Condamine and his colleagues, which was shortly afterwards followed by another order for the *destruction of the pyramids, and the erection of others* in their place.

From the moment the work of demolition commenced, the correct measure of the base of the French Academicians was lost for ever, as it cannot be supposed that the Indians employed in the work of destruction, after seeking among the foundations for some hidden treasure, would have replaced the stones which occupied the centre of the pyramid in the same line of direction they originally occupied, or that even on their reconstruction by the unscientific hands on whom the labour devolved, that the sides of the pyramids were made to face the four cardinal points of the compass. Mathematically speaking, therefore, the results of the labours of the French Academicians in Peru, it is to be apprehended, are totally lost, and the only value of the monuments erected, on or near to the site of those constructed by them, will be to commemorate an expedition undertaken for extending the domain of human science.

The annexed plate represents the identical mill-stone planted by La Condamine, at Oyambaro, the centre of which marked the southern extremity of the base line measured off by the French Academicians on the plain of Jaureguy.

The accompanying Report of the notary Juan Bautista Castrillon, throws no light on the subject. From its style and orthography, the writer was evidently totally unfitted for the special service on which he was employed. Still, the description he gives of the *decombres* of an ancient edifice, coincides exactly with the nature of the materials employed by La Condamine for the foundation of the southern pyramid. But the circumstance of its having been found lying on a soft mould, at a distance of five feet one inch from the old foundation, is a strong proof that the stone has been removed from the spot where it originally was placed. It appears singular, that this commission did not direct their investigations to the northern extremity of the line at Caraboura. Both La Condamine and Alloa have left memoirs on the subject that would have assisted them in their investigations. But from the manner in which their proceedings were conducted, no result of any scientific importance can arise from the mere and accidental discovery of the southern meta of the base line. The essential point would have been to have ascertained if *both* really occupied the same spots and directions in which they were originally placed at Oyambaro and Caraboura.



TRANSLATION.

I, John Bautista Castrillon, Captain of Infantry, Public Notary to the Departments of the Treasury, Dezimos, the Mint, and War, in the capital of the republic of the Equator, certify, that from the information given to his Excellency Don Vincente Rocafuerte, President of the Republic, by Colonel Ipolets Lonlin, charged with the restoration of the pyramids which in the year 1736 were erected by the French academicians for determining the length of an arc of the meridian under the equator, to the effect, that on making the foundations of the pyramid to be erected at the southern extremity of the line at Oyambaro, he had discovered the stone originally placed on the same spot by Monsieur de la Condamine *to indicate its centre*, his Excellency, animated by that zeal which so eminently distinguishes him for the advancement of the science and civilization of the equator, directed the undersigned notary, accompanied by the First Commandant, Francisco Antonio Baquero, aide-de-camp to his Excellency, to proceed to the aforesaid spot Oyambaro; and in order to array the act with more solemnity, he invited Mr. Walter Cope, his Britannic Majesty's consul, and Colonel Richard Wright, to accompany the commissioners, for the purpose of cooperating in the examination of the stone, and the other circumstances connected with it.

Accordingly, on Monday the 21st instant, these dispositions were carried into execution on the spot selected for the base of the new pyramid; at which there was likewise present Colonel Sonlin, Dr. Joaquin Villaviciencio, curate of the parish of Jaruqui, and his assistant, Lamon Acuña; and having proceeded to the inspection of the stone, which was discovered in a newly opened ditch, two baras deep, and quite exposed from the excavating which had been made. It was lying on soft mould, at a distance of five feet five inches to the eastward of the spot marked out for the centre of the new pyramid. Having uplifted it, for the purpose of examining and of replacing it in the very spot or base it had originally occupied, it was found to be five inches thick and four feet three inches in diameter. Its upper side was smooth, and on the northern side of its circumference was engraved the word Meta, and, in the opposite direction, the word Aust; the lower side was in the rough and without inscription. The excavated earth and the sides of the ditch contained the *debris* of tiles and other marks, indicating an ancient edifice, but there was no entire foundation. Such is the result of the commission, and which I in truth can certify for its future and perpetual verification, signing the present document in the Havenda de Oyambaro, in the jurisdiction of the parish of Yaragui, 29th May 1837.

(Signed) JUAN BAUTISTA CASTRILLON.

[Here follow the attestations of the signature above of three public notaries of Quito, and also the attestation of his Britannic Majesty's consul, Mr. Walter Cope, to the notarial signatures.]

THE CELESTIAL GLOBE.

SINCE the first invention of the celestial globe, at a very remote period, as an aid to the acquirement of skill in the science of astronomy, great improvements have by degrees been effected in its manufacture. The result of these is, that the stars are now more correctly delineated, both as regards their number, their position, and their relative magnitudes; the equinoctial, meridional, and other circles, afford increased facilities for the solution of many interesting problems; while the elegant style of the workmanship, in all its details, leaves nothing on this head to be desired.

Successfully, however, as the plan adopted has been carried into execution, it is obvious that the instrument, in its present state, is far from exhibiting a faithful representation of the aspect of the heavens on a fine night. All that the eye then and there gazes on, is the dark firmament, studded with brilliant constellations, varying in number according as the atmosphere is more or less free from obscuring vapour. It beholds neither the lines which intersect each other on the artificial globe, nor the fanciful figures which have, from time immemorial, been assigned to the different clusters of stars.

The globe is also chargeable with another incongruity, namely, that of showing the stars on a convex, instead of a concave surface. This deviation from the natural order, is a source of much perplexity and discouragement to the young student, who is compelled to imagine that his eye is placed in the centre of the globe, and that the stars are transparent, before he can form a conception of their exact appearance in the firmament itself. A very small number of globes have, indeed, been constructed, at great expense and of large dimensions, to which these inconveniences do not attach. Thus, there was deposited in the Academy of Sciences at St. Petersburg, in the beginning of the last century, a sphere, eleven feet in diameter, called the Globe of Gottorp, (from the name of the place where it was originally made,) on the inner surface of which the heavenly bodies are described, according to their relative magnitudes, by means of gilded nails. It contains accommodation for twelve persons, who, on the machine being made to revolve, witness the true position, with the rising and setting of the stars. A globe on a similar plan, but of a much larger size, was erected at Pembroke College, Cambridge, by the late Dr. Long. It is eighteen feet in diameter, the constellations are painted, and, an entrance being contrived, as in the former instance, near the south pole, 30 persons may conveniently view the exhibition at the same time. The first of these instruments is permanently adjusted to the latitude of St. Petersburg, the last to that of Cambridge, for which latitudes alone they are respectively available. Globes of those enormous proportions, though fully accomplishing the object for which they were designed, cannot be rendered useful to any considerable extent, in consequence of their massiveness, the impossibility of moving them, under ordinary circumstances, from one place to another, the cost of their construction, and their limitation to a single latitude.

A few days ago, we had an opportunity of inspecting an ingenious apparatus, lately invented and manufactured by Mr. Winter, with the design of removing the objections which are sometimes urged against the common celestial globe, and furnishing a correct imitation of the natural heavens. It consists of a globe with the usual internal features, and a hollow hemisphere lined with white paper. The principal stars in the former article being pierced, and a lamp lighted in its centre, they become, of course, illuminated. The hemisphere, which is suspended by a cord and pulley over the globe, now receives on its concave surface the impression of the stars, formed by the rays of light as they pass through the perforations in the globe. Hence, while the globe claims all the advantages possessed by that which is in general use, and likewise admits of being illuminated, the hemisphere presents to the eye a striking picture of the firmament, as we behold it on a cloudless night, the constellations pursuing their regular course from east to west, the northern ones making the circuit of the pole without ever ceasing to be visible, as those which have a more southerly position, are seen to emerge from below the eastern horizon, gradually to acquire their greatest altitude, decline in the west, and ultimately disappear.

Having carefully examined the two instruments which we have thus briefly described, at a time when they were in conjoint and effective operation, we cannot hesitate to recommend the invention to the notice and patronage of the public. To the inmates of schools, as well as to young persons in general, who are desirous of being well grounded in the rudiments of astronomy, it could not fail to be particularly acceptable; since the pupil could certainly acquire, by its aid, in a single lesson, a more precise and permanent acquaintance with the names, the relative positions, and the uniform progression of the celestial bodies, than by devoting hour after hour to the comparatively irksome task of poring over the ordinary globe.

The globe which we inspected was 12 inches in diameter, and the hemisphere 3 feet. We understand that the former is made by Cary, of all the usual sizes; the latter of any diameter varying from 3 to 6 feet.

INSTITUTION OF CIVIL ENGINEERS.

TELFORD AND WALKER PREMIUMS.

THE Council of the Institution of Civil Engineers have awarded the following TELFORD and WALKER Premiums:

To William Fairbairn, M. Inst. C. E., for his Paper "On the properties of the Iron Ores of Samakoff (Turkey)," &c.—To John Murray, M. Inst. C. E., for his "Description and Drawings of the removal of the Lighthouse on the North Pier, at Sunderland."—To James Bremner, M. Inst. C. E., for his Papers "On Pulteney Town Harbour," "Sarclet Harbour," "A new Piling Engine," and an "Apparatus for floating large stones for Harbour Works."—To Andrew Murray, Assoc. Inst. C. E., for his Paper "On the construction and proper proportions of Steam Boilers."—To Alexander Angus Croll, Assoc. Inst. C. E., for his Paper "On the purification of Coal Gas, &c."—To James Braidwood, Assoc. Inst. C. E., for his Paper and Drawings descriptive of "The means of rendering large supplies of Water available in cases of Fire," &c.—To Jacob

Samuda, Assoc. Inst. C. E., for his "Account of the Atmospheric Railway."—To Charles Hutton Gregory, Grad. Inst. C. E., for his Paper "On Railway Cuttings and Embankments."—To Captain William Scarth Moorsom, Assoc. Inst. C.E. for his "Description and Drawings of the Avon Bridge at Tewkesbury."—To Thomas Grissell, Assoc. Inst. C. E., for his "Description and Model of the Scaffolding used in erecting the Nelson Column."—To Charles Manby, Secretary and Assoc. Inst. C. E., for the translation and arrangement of the "History of the Canal and Sluices of Katwyk," and the "Description of the Works of the Amsterdam and Rotterdam Railway," by the Chevalier Conrad, M. Inst. C. E.—To the Chevalier Conrad, M. Inst. C. E., for his "Description and Drawings of the Works of the Amsterdam and Rotterdam Railway."—To James Leslie, M. Inst. C. E., for his "Description and Drawings of the Iron Lock Gates of the Montrose Docks."—To John Geale Thomson, Grad. Inst. C. E., for his "Description and Drawing of the Landslip in the Ashley Cutting, Great Western Railway."—To John Timperley, for his "Account of the building of the 'Wellington' Bridge, Leeds."—To George Willoughby Hemens, Grad. Inst. C. E., for his "Description and Drawing of a wrought-iron lattice Bridge on the Dublin and Drogheda Railway."—To William Evill, Jun. Grad. Inst. C. E., for his "Description and Drawings of the London Terminus of the Eastern Counties' Railway."—To Arthur John Dodson, Assoc. Inst. C. E., for his "Description and Drawings of the Hydraulic Traversing Frame, used on the Great Western Railway."—To James Forest, Jun., for his "Drawings and Diagrams illustrative of numerous Papers read at the Meetings."

FINE ARTS.

The Committee of the Art Union seem determined to prove themselves patrons of art upon a larger and more important scale than heretofore. They have advertised a prize of £500 "for an original picture illustrative of British History." Cartoons, measuring six feet by four feet six, are to be sent in by the 1st of January 1846; besides which, the artists, if required to do so, will have to send in "specimens of their abilities as painters." It is added, that "the successful candidate must undertake to complete the finished picture of the same size as the cartoon by the 1st of January, 1847, and to superintend the engraving." The Committee explain that the reason they give so long a period as till January, 1846, for the preparation of the cartoons, is, that artists may have time "thoroughly to study the various details," and to produce in the cartoon a completely finished subject for a picture. We do not think a twelvemonth at all too long a time for the production of the study of a grand historical picture, but we think that the committee would have done better if, instead of a cartoon, they had required the study to be sent in on a reduced scale in oils,—which would have served the purpose at the same time of estimating the artist's " abilities as a painter." Nevertheless, we heartily wish this novel experiment success. The Committee take the precaution, however, of reserving the right of withholding the prize " if works of sufficient merit be not submitted."

While on the subject of cartoons, which leads us to that of fresco painting, we are sorry to hear it whispered abroad that the experiments in fresco painting recently made in the summer-house at Buckingham Palace have with one exception proved failures, owing to the artists' want of experience in the manipulative treatment of this style of painting. We have much yet to learn and to do before we can decorate our Houses of Parliament on the scale proposed.

In publications, with the exception of the Annuals, which are as glittering and as flimsy as usual, we have very little to notice to-day. A pretty circular piece by Landseer, engraved by Cousins, is interesting, as representing our gracious Sovereign in the character of " a Mother," and so styled in the print. Her Majesty is seated with the infant Prince of Wales in her lap, and the Princess Royal clambering up beside her, and playing with a glittering necklace round her Majesty's neck, who, with a benignant smile on her countenance, is addressing some little playful admonition. The subject generally is well treated, but the breadth of drapery, and high light thrown upon the infant prince, are more justifiable as a poetic licence than by the ordinary rules of art.

Carrick's Portraits of Lord J. Russell and Viscount Morpeth, engraved by Bellin, are good likenesses, particularly the former, which has all the character of the original, and admirably engraved.

Mr. Doane's Portrait of that pleasing actress Miss Julia Bennett, done in lithography by Fairland, is an attractive print, and a tolerable likeness. The disposition of the figure, however,—hands, face, hair, every thing, is too studied for " effect," inducing a suspicion of affectation.

Amongst the beautiful Annuals of the year, we must not omit to mention the " Regal Pocket Book," published by Brookes, Brothers; it is indeed an exquisite specimen of typography.

NEW MUSIC.

"*La Dernier Roi de Juda.*" (Opera Biblique en 2 actes.) Libretto de MAURICE BOURGES; partition de GEORGES KASNER.

UNDER the above title a new Oratorio was produced at the *Conservatoire*, on the 1st of December. We are led to notice it, not for its intrinsic merits, the which are unknown to us, save through the very suspicious medium of a music-seller's Review, but to call the attention of our musical readers to the fact, that France has set a new fashion in music; that having exhausted her sensations in the Polka, she turns to the Prophets, from Cellarius to Jeremiah. As we followed her in the fulness of her ecstasy we can do no less than imitate her in the depth of the revulsion which she has just undergone; and rushing to Paternoster Row, furnish ourselves with Theology. The Lives of the Saints might afford full scope to our musicians, although even therein *Jeune France* has anticipated us, *teste sancto Centurio.* The work which we have named above seems, from the details of the plot, to be a servile and ineffective copy of Rossini's Moisa, which must be wholly forgotten before there can be room for any imitative counterpart. Of course we only speak of the plot; but identity in that may lead to similarity in its musical treatment, or to disappointment in a too marked difference. When we have received our copy of the work we shall revert to the subject, which we hope to find as valuable an addition to our stores of Sacred Music, as the elaborate eulogy of the French critic would lead us to expect it to be.

THE SOCIETY OF BRITISH MUSICIANS.

WE owe many apologies to this Society for the delay which has arisen in announcing the resumption of their meetings; the change in our arrangements, and consequent press of matter and limitation of space, are the causes to which we are reluctantly compelled to submit. We are by these causes precluded from that detailed account of the meetings and of the compositions produced at them, which it was our gratifying office to exhibit last season. But we cannot allow any causes, however stern and exclusive, to prohibit the expression of our admiration of the zeal and constancy with which the Society is sustained, and of which we entertain the most sanguine augury of success. The contributions to the concerts have been chiefly from the hands of the members of last season, Calkin, (James,) Horsley, Orger (Miss), Stephens, (C.) Jewson, Neate, and others, who must pardon the unintentional omission of their names, have upheld the character of the Society, and in many instances, advanced its claims to that public favour which must ultimately be its reward. If we desire anything in the productions of the rising musicians, who exhibit in this arena, it is a little *practicality* in their ideas. If they would but watch the audience when a *substantive* idea is brought before it, they would instantly recognize the value which the cultivation of this important branch of their art possesses, as the keystone of a musician's fame. We should be glad to find that more original concerted vocal pieces, and vocal pieces with *obligato* accompaniments for wind or stringed instruments (not to récherché) were admitted. The latter, we are sure, would prove profitable as well as pleasing. The pieces of this class are few, but always heard with delight; when they have failed to please, the failure has been the result of their difficulty and dryness, under which the sentiment of the subject, and of the performers, has been equally submerged. The Society has recently added to its numbers, whom we hope to find daily increasing and get stronger in internal energy, by which alone their battle can be won. Above all, let them never forget that they are by their own naming, BRITISH MUSICIANS, that in the literature of their own land, they must find the sister spirit of their art, and in the wholesome sympathy of their fellow-countrymen, the reward and support of their efforts.

THE DRAMA.

THE NEW COMEDY AND THE "PRIZE" COMEDY.—THE DAUGHTER OF ST. MARK.—THE CHIMES.

THE successful production of a new five-act comedy at the Haymarket Theatre within so short a period after the sad failure of the Prize Comedy experiment, is certainly a circumstance worthy of remark. We are not at this time of day going to enter into a criticism upon Mr. Bourcicault's *Old Heads and Young Hearts.* Sufficient for our purpose is it that it exhibits much cleverness, and abundant elements of amusement;—and that it has fully answered its purpose of putting audience, actors, manager,—and for the most part,—the critics into good humour. In a word, it has been completely successful as respects those two great elements, applause and profit. But how comes it, we ask, that when England contained such a man as Mr. Bourcicault, and Mr. Bourcicault had such a comedy as *Old Heads and Young Hearts* in his brain, or in his pocket, Mr. Webster should have sent out a hue and cry, with 500*l.* reward, and "other contingent advantages," for the discovery of a five-act comedy of modern manners and customs, and sent out in vain,—for the result was worse than nil? One hundred and one candidates pretending to answer to the description in the hue and cry, presented themselves to Mr. Webster, and a commission of seven of the most comic men in England was appointed to decide upon their pretensions. For four months this council of seven sat in deliberation upon the cart-load of manuscripts submitted to them; some score and odd meetings had they, and at last, by unanimous decree, out came *Quid Pro Quo, or the Day of Dupes*, as the fortunate one, produced it was at once with all convenient speed, when its fate afforded significant verification of the appropriateness of one of its titles, but as solemn denial to the expectations held out in the other. All this was very discouraging, and gave occasion for many complimentary reflections upon the astuteness of the comic committee, for none, we believe, impugned for one moment their fairness, and for speculations upon the amount of unappreciated merit which must lay concealed amidst the hundred rejected competitors. For none believed it possible that the united genius of England could fail of producing something better than *Quid Pro Quo;* and every body seemed to imagine that all the literary talent which England possessed—Bulwer, Sheridan Knowles, Poole, Jerrold, Planche, &c.,—would have come forward to compete in honourable rivalry for the munificent prize which Mr. Webster offered. Never was there a greater mistake than so to imagine; and from what we have heard upon good authority, we believe we may state, that not only not one of the writers above named were amongst the competitors, but that with perhaps one or two exceptions, no one of any experience or reputation in dramatic literature sent in a line. How this happened we will not undertake to say; it is quite possible, however, that there may have been certain special reasons to diminish the value of the prize itself, even supposing it gained in the eyes of some of these gentlemen, to say nothing of their disinclination to write for an uncertainty, when they might always write for a certainty, if they chose.

But the best proof of the very mediocre character of the works sent in for competition,—of which, as we understand, the committee repeatedly complained, is now given by the fact, that although six months have elapsed since the withdrawal of *Quid Pro Quo*, no one of the hundred disappointed candidates has ventured to "shame the fools" by printing, or fooled a manager into producing, one of their productions.

And this induces us now, in justice to the committee, upon the unfortunate result of whose labours we made some observations at the time, to state a few facts which have come to our knowledge in connexion with their performance of their arduous task. It has been asked by various persons—and ourselves amongst the number—why, granting that *Quid Pro Quo* was the best of the competing comedies,—yet why, being so bad, the committee consented to give it the prize? And Webster even has been pitied for having so worthless an affair forced upon him, and being made to pay 500*l.* for it, besides the expense of producing it. Why did they not reopen the competition, or decline to adjudicate the prize, it has been asked,—and so save poor Webster his 500*l.*? A simple statement of facts, answers these questions, and in a manner which does equal credit to the judgment and discretion of the committee, and the liberality of Webster. We know it to be a fact, that, when the committee had got through about half their work, having examined some fifty or sixty plays, without finding one that had any pretensions to dramatic merit, one in fact, that could possibly be put upon the stage, the idea struck them, that it was very possible the remainder might prove as unavailable for the purposes of the manager, and his intention in offering the prize. They then requested the company of Mr. Webster, and put the question to him, whether in case of such a result, the committee would have the power to withhold the prize, and reopen the competition; a power which has commonly been exercised on occasion by committees for such purposes. Mr. Webster replied, that he felt the force and justice of the suggestion, but that he was precluded from acquiescing in it; having been led by some communications which had reached him through the prints or by other channels, to give a pledge that the prize should in any case be given to one of the MSS. sent in, in conformity with the advertisement, which one the committee had to decide, and that if they declined to decide upon one, he would be obliged to endeavour to appoint another committee, and so to go over all the labour and trouble again. Mr. Webster was then asked, whether, supposing the play selected, should be such that there would be no probability of its being acted on the stage with success, or even listened to by the audience, he would still consider himself bound to make the experiment by producing it. The reply was, that he apprehended he should be so compelled, in consequence of the "contingent advantages," as the twentieth, fortieth, and sixtieth nights, &c., mentioned in the advertisement, and the injustice which would be considered to be done to the author of the play, after its being selected by the committee, in not producing it. Under these circumstances, the committee resolved to go on with their labours, and to select the best of the lot, whatever it might be, having regard as well to general literary merit, and the possibility—the physical possibility—of production on the stage. The result every body knows. We have entered into these facts considering them of interest in our literary history, and can vouch for their accuracy in every particular.

For the rest, the theatricals of the past month, as they generally are the few weeks preceding Christmas, have been rather barren of results. With exception of the Christmas pantomimes, which came upon us too late for us to give any account of them, we have only had two novelties of any importance. Mr. Balfe's opera of "the Daughter of St. Mark," at Drury Lane, is considered by the musical critics to be a finer and more artistic work, as a whole, than any of his former productions, even his great favourite the "Bohemian Girl." It does not so abound, however, in catching and pleasing melodies, requires to be heard and heard again before is merits are appreciated, and labours under the disadvantage of a most lame and incomprehensible *libretto*.

At the Adelphi, Mr. Dickens's new "goblin story," *The Chimes*, was produced on the stage, within sixty hours of its being issued from the publisher's. The book itself, however, is no more like the joyous "Carol" of last year than vinegar is like wine; it is growling, and gloomy, and illiberal; and whilst its avowed purpose is to advocate the cause of the poor, we fear it does so in such a tone as not to promote the better feelings either of themselves, or of the wealthy towards them. For its "goblin" machinery, it is precisely that of last year, a little perverted. In the book it reads heavily, unpleasantly, painfully: but on the stage, it is dreary and wearisome beyond human toleration.

EXPLOSION OF THE HASWELL COLLIERIES.

REPORT FROM MESSRS. LYELL AND FARADAY, ON THE EXPLOSION OF THE HASWELL COLLIERIES, AND ON THE MEANS OF PREVENTING SIMILAR ACCIDENTS—

SIR,—HAVING, in our former letter[a], expressed our entire concurrence in the verdict of the jury, which exonerated the Proprietors of the Haswell Colliery from any blame in connexion with the late fatal accident, (September 28, 1844,) we now proceed to consider how the recurrence of similar catastrophes may be obviated in future.

The Haswell Collieries, where the explosion occurred, are situated about seven miles east of Durham, in that part of the Durham coal field which is overlaid by the magnesian limestone, and about two miles within the outer limit or escarpment of that formation. In sinking the main shaft, which is 155 fathoms deep, they passed through, below the outset or artificial elevation, first, 18 feet of soil, gravel, &c., then 363 feet of limestone, red shale, and sandstone of the magnesian limestone formation, and afterwards through 540 feet of the coal measures; the strata of both formations being so nearly horizontal, that they may be considered as being here in parallel or conformable position. The section of the beds passed through in excavating the shaft, will show that no less than ten seams of coal were met with, varying in thickness from 1 inch to 3 feet 7 inches; and that at a depth of 925 feet from the surface, the coal called the Hutton seam was gained, which is 5 feet 5 inches thick, comprising, first, the top coal of superior quality, 4 feet 1 inch thick; secondly, layers of impure coal, 16 inches thick, the upper portion of which, called the brassy coal, is much charged with pyrites, and the lowest part, or better quality, is said to give out much more gas than the top coal. The dip of the beds is about 1 foot in 24 to the S.E.[a]

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[a] This letter is not included in the report, which is published verbatim.

In the Great Pit, which lies to the S.W. of the Little Pit, and is ventilated by the same shafts, a large dike of trap or greenstone was encountered, which had turned the coal into coke, with numerous veins of calcareous spar, for a distance of about 40 yards from the point of contact. Notwithstanding the intrusion of this igneous rock, the strata in general are remarkably undisturbed. In the Little Pit, which we examined carefully, only two or three slips of a few inches, and one fault of two or three feet, appeared. The roof near the entrance shaft was of white sandstone, with occasional seams of mica, but throughout the greater part of the workings, which are about 250 acres in extent, the roof or ceiling is composed of shale, very unbroken and secure, and having given rise to extremely few accidents, by falling in, in the course of the thirteen years during which the pit has been opened. The chief danger to be guarded against, arises from what are termed "cauldron bottoms," which are the stools or lowest portions of erect fossil trees, filled with sandstone or shale, and having their bark converted into coal, which gives way when they are undermined, and allows the heavy cast of the interior of the trunk, several feet or yards in height, to descend suddenly. The Hutton seam rests on a sandy clay, which has not been found adapted for a fire clay. The floor composed of it does not often rise in creeps.

It will be seen by the section, that several upper seams of good coal, the united thickness of four of which is no less than 13 feet, have been left untouched, in order that the thicker and more valuable seam called the Hutton, should first be worked out. In adopting this plan, the Proprietors have been guided by considerations of present profit, which the competition of other neighbouring coal works renders indispensable. Nevertheless, it may not be improper for us to advert to two evils which result from this system.

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[a] As no part of the section obtained in sinking the shaft of the Haswell Pit was exposed to view at the time of our visit, except the lowest ten or twelve feet; the division into coal measures and magnesian limestone, and of the latter into upper magnesian and lower red sandstone, with about twenty feet of superficial gravel and clay, has been inferred from the description of the beds given in the miners' section. We have substituted geological names for the miner's terms, as far as we were able to do so.

First—The upper seams which are undermined on the extraction of an inferior bed of coal, sink down, often unequally, from failure of support, and become fractured, and therefore much more liable to give out gas, which gas (it is well known by experience) has sometimes found its way into the workings far below, as attested by Mr. Buddle in his evidence given to the Committee of the House of Commons in 1835; by which some of the most serious accidents from fire damp have been occasioned. The greater the number, and the larger the size of the upper seams, and the nearer they lie to the seam which is worked at a lower level, the greater the risk of such communication by fissures.

Secondly—The higher beds of coal, which might have been worked to advantage before they were undermined, and when the expense of a shaft had been already incurred, may never be available after the workings have been for many years abandoned, and the shaft partially filled up, and after the coal has been injured by the continued permeatation of water and gas through its fissures, whereby property of great value may be irrecoverably lost to the country. With a view to prevent this prospective evil in the mines belonging to the Duchy of Cornwall in Somersetshire, it has recently been proposed to make provisions in the new leases to secure the more regular extraction of all the workable seams which, exclusive of the great seam, range from 14 inches to 2 feet in thickness, the whole of them being less considerable than five of the seams neglected in sinking the Haswell shaft.

Before going into a particular consideration of the causes of the late accident at Haswell, and the possible means of preventing the recurrence of the like in future, we wish to point out the fact well known to the viewers in this district, that the pits on the north side of the Wear, in which the Hutton seam is worked, are more infested with fire damp than those on the south side of that river. If, therefore, at Haswell Colliery, situated among the latter, the danger has proved to be so great, still more necessary will it be to endeavour to take additional precautions elsewhere.

There can be no doubt that as regards the safety of the men in the coal mines from injury consequent upon fire damps, ventilation is of the utmost importance, but there is a practical limit beyond which it cannot be carried, for in works deep and extensive, as the coal mines often are, to dig shaft after shaft would quickly involve an expense more than the value of the produce of the mine, and have the effect of closing it altogether. There is one point in ventilation, however, which, at the same time that it appears to us capable of improvement, touches a part of the mine of the utmost consequence to the safety of the whole; and though our observations and thoughts are not founded upon long experience, or the examination personally, of many mines, yet considering that the one we have so recently been called to observe is as simple in the character of its workings, contains as small a proportion of fire damp, and is as well ventilated, as any in that part of England, surpassing in these respects most of the mines, we do not think that they will be exaggerated in respect of, or less applicable to, other cases. We allude to the ventilation and general character of the *Goaf.*

The *Goaf* is a mass of ruins in the middle of the works, growing from day to day, as the workings of the mine extend. The miner, as he works in the undisturbed coal (which is called the *whole*), removes it, so as to form passages which are usually parallel to, and at right angles with, each other; the square portions of coal left between them are called *pillars;* the passages or ways are, upon the average, about 5 yards wide, and the pillars are about 16 yards by 22 yards; the pillars, whilst they remain, support the roof, and the superincumbent rocks and strata; this part of the works is called the *broken.*

Afterwards the coal of the pillars has to be removed, and as it is carried off, the roof so exposed is supported by many wooden props; this state of things constitutes a *jud:* at last these props are withdrawn, and this is called *drawing a jud;* during or after which the roof falls in masses, larger or smaller according to circumstances, a fall being sometimes many tons in wreight. The pillars are not removed indifferently, but those next the mass of ruins already formed, are taken away first, so that the first *jud* which is drawn, produces a heap of broken strata, and this, increasing with every succeeding jud that is removed, forms the *goaf.*

These goafs grow to a great size[a]. There are three in the Haswell Little Pit; two are small as yet; the largest has an extent of thirteen acres. At the edges they are very loose and open, having accidental cavities and passages for air running into them, as might be expected from the falling of rocks from a height of five feet, one upon another. There is every reason to believe, that the falling goes on towards the middle of the goaf, but how high the heap of broken strata and the vault en-

[a] Goafs vary in size: that at the Meadows Flat Little Pit is 13 acres; the goaf of the High Brockley Whin is 1¾ acres, and the one at the Low Brockley Whin 1½ acres. In the North Way of the Little Pit at Haswell, there is a goaf of 35 acres, and in the Engine or Great Pit, one of 17 acres. Perhaps the greatest goaf is that at Felling, near Newcastle-upon-Tyne; it is in the same seam as the Haswell, and has an extent of upwards of 100 acres.

closing it, extend, is not known in a large goaf, or, as far as we are aware, even in a small one. The goaf may be considered as a heap of rocky fragments rising up into the vault or cavity from which it has fallen, perhaps nearly compact in the parts which are the oldest, lowest, and nearest the middle, but open in structure towards and near its surface, whether at the centre of the goaf or at the edges; and the vault or concavity of the goaf may be considered as an inverted basin, having its edge coincident with the roof of the mine, all round the *goaf*. Within this basin there must be air space (as long as the surface of the country above has not sunk) either in the space between it and the goaf, or in the cavities of the goaf itself, nearly equal to the bulk of coal removed; this in a goaf of thirteen acres, and a seam in which five and a half feet of coal, including the top and bottom, are taken away, is equal to a vault five and a half feet high and thirteen acres in extent.

Let us now consider this goaf as a receptacle for gas or fire damp, a compound of hydrogen and carbon, known as light hydrocarbonate, and by other names. The weight of pure fire damp is little more than half that of air; it gradually and spontaneously mixes with air, and the weight of any mixture is proportionate to the quantities of air and fire damp. Any gas that may be evolved in the goaf, or that may gradually creep into it along the roof of the workings, against which it will naturally flow, will ascend into the goaf vault, and will find its place higher, in proportion to its freedom from air; and this will go on continually, the goaf vault forming the natural basin into which all gas will drain (upwards), from parts inclining to the goaf, just as a concavity on the side of a gentle hill will receive water draining downwards from its sides, and from the parts above inclining towards it.

The gas which may thus be expected to collect in the goaf of a mine, where there is any fire damp at all, cannot escape at the top of the goaf vault; instead of passing away there, the whole surface of the vault may rather be viewed as having a tendency, more or less, to evolve gas from the upper broken and bruised coal measures (often containing small seams not worked) into the space beneath; and the only escape for the gas is by the flowing of it under the edge of the goaf vault into the workings of the mine. Two main circumstances tend to this effect: the one, the continued accumulation of gas in the upper part of the goaf vault; the other, the continual tendency to mix with the air beneath, and consequent formation of mixtures larger and heavier than the gas itself. As Sir Humphry Davy has stated, any mixture containing from one-fifth to one-sixteenth of the gas will explode. These mixtures are of course from six to seventeen times greater in volume than the fire damp in them, and evidently not much lighter than air (0.91 and 0.96). Except, therefore in the almost impossible case of a goaf quite filled with fire damp, it will be these or weaker mixtures that underflow the edge of the vault, unless upon extraordinary occasions.

The underflow will not take place all round the edge of the goaf basin, but at that point which is highest; for just as water takes its level in a pond on the side of a hill, and flows over the lower edge, so here, air strata of equal density will be horizontal. Coal seams are rarely quite horizontal; in the Little Haswell Pit, the rise is about 1 in 24, and the coal very regular. At the lower edge of such a goaf, nothing but pure air might be present in the air space, and also for a considerable distance up into the vault; yet at the upper edge, a mixture of gas and air, and even a highly explosive mixture might be escaping.

Thus goafs are evidently, in mines subject more or less to fire damp, reservoirs of the gas and explosive mixtures; giving out their gas into the workings of the mines by a gradual underflow in smaller or larger quantities under ordinary circumstances, or suddenly, and in great proportion, on extraordinary occasions: and they may either supply that explosive mixture which first takes fire, as appears to have been the case at the spot called Williamson's *jud*, close to the goaf of the *Meadows working* of the Haswell Little Pit; or they may add their magazine of fire damp and explosive mixtures, to increase the conflagration when the fire reaches them from an explosion in some other part of the mine: this appears to have been the case at the goaf of the *High Brockley Whins* working, on the occurrence of the Haswell event.

We are bound from all the evidence, and from our own personal examination, to state on the part of the owners and officers of the Haswell Colliery, that as far as the principles of ventilation in coal mines have been developed and applied, and in comparison with the general practice of the trade, the Little Pit appears to have been most admirably ventilated. No expense seems to have been spared in the first setting out of the works, or in carrying them through, or in the daily arrangements under ground; and this care was further favoured by the natural circumstances of the mine, the seam of coal being very regular, having a strong shale roof or ceiling, and with scarcely any fault. The mine has the character of being one of the best ventilated in the whole trade, a circumstance which, though it leads us in the fullest degree to exonerate the owners and officers from all blame in reference to the late terrible event, makes us more anxious, if possible, to discover its cause, and suggest some practical guard against its recurrence in future. With this intention, and without going into the ventilation generally, we will state our view of its effect at the goaf. A great body of air, equal to 25,400 cubic feet per minute, is sent into the Little Pit, and a third part of that goes to each of the three workings. This is directed according to the judgment of the viewer, to various parts; the main portion to where the men are at work, and certain portions to the waste and the goaf. In the main passages, as the Rolley way, Mothergate, &c., the wind is so strong, that it is almost impossible to keep a candle lighted; but where the works expand, it becomes slower, and the speed is least in the waste and the goaf. As a matter of observation, we found the speed small at the goaf, though full care had been taken by stoppings, &c., to make the current good and strong in the workings near it, *i. e.*, in the upper boards. If it be considered that the goaf is about thirteen acres in extent, and that with the surrounding workings, it can hardly be less than twenty-six or thirty acres, the diminution in speed of the current of air there, can easily be understood.

The air which flows into a mine will generally tend to move along the floor, for it is colder, and therefore denser than the air against the ceiling, warmed as it is by the men and the lamps, and it is heavier than any mixture of air and fire damp. Where the men are at work, this tendency is guarded against by the force of the current sent in, which sweeps the air already there, before it, but in the goaf, near which the current is slow, where the roof is a large concavity, where the gas, if present, is likely to be present in greater quantities, and so to make a mixed atmosphere which is lighter than that in the working parts of the mine; there the current probably never ascends to any height, but takes its way sluggishly through the lower parts of the goaf, or moves round the outside of it. We think it probable that the current does not rise much above the level of the highest point in the edge of the goaf basin, and that the top of the goaf is seldom, if ever, reached by it in any sensible degree.

We have thus far considered the goaf as if in something like a constant state, but there are occasions of sudden and limited disturbance which affect the atmosphere of gas within and about it. The evidence at the inquest states, that a rumbling was heard on the morning of the accident within the goaf, and this was probably a fall somewhere from its roof. Such falls tend to mix the lighter and heavier strata of gas and air, and so virtually cause the gas to descend. Again, if the atmosphere four or five feet up in the goaf be an explosive mixture, and a fall of this kind take place there or near it, such an event is very likely to throw out a portion of explosive mixture into the workings of the mine, not merely by the agitation, but also by the mixture of upper with lower strata of air, making the lower explosive.

One cannot but suppose that another source of sudden and partial evolution of gas or explosive mixture from the *goaf*, may be the fall of upper parts of its roofs, and the crushing of the rocks there, by which gas pent up into the seams of coal above and the strata associated with them, has passages opened for its escape into the goaf. If a bag of gas (as it is called) were thus opened into the goaf, it would rapidly increase the quantity of gas in it, and might soon cause explosive mixtures, or the gas, almost pure, to underflow the edge of the concavity into the mine.

If the goaf cavity were full of gas or explosive mixture to the highest edge level, the mechanical fall of the roof, in drawing a jud close to that edge, would, by mere agitation, drive some portion of the gas or mixture into the workings of the mine.

When a jud is drawn, and the roof has fallen in, the fall becomes part of the goaf, and the cavity left by it becomes a part of the goaf basin, the edge of the basin extending to, and enclosing the new fall. If this take place at the highest point of the basin, it suddenly opens a passage into the mine for a great quantity of air and gas, which before, by its relative levity to the air, was retained in the goaf basin. Thus, assuming a goaf of 13 acres in a coal seam inclined 1 in 24, and that a fall of 6 feet in extent takes place in the roof at the highest edge of the goaf, it would heighten the edge at that spot three inches; and if the goaf were full to the edge, either with fire damp or explosive mixture, these would flow out more or less rapidly into the workings of the mine, until a horizontal stratum of three inches in thickness had thus escaped. Even if the roof of the goaf rose very slowly, making an exceedingly flat dome, this stratum would extend to four-fifths or more of the horizontal area of the goaf; and assuming that the greater part of this space is occupied, not by gas, but by the solid materials of the goaf, and that only a band round the goaf could be considered as air space—still from what we saw of the goafs at the Haswell Little Pit, this would be from 4 to 6 feet in horizontal extent, so that a mass of explosive atmosphere or fire damp might escape equal to a band about 3,000 feet long, by 5 feet wide, and 3 inches deep, making about 3,750 cubic feet. It is not likely that this would escape all at once; but the tenth, the twentieth, or the fiftieth part, or even the hundredth part, would be enough to take fire at an injured lamp, and to communicate fire to the whole, though the whole condition between safety and danger up to that moment may have depended upon three inches of the roof.

The above is no hypothetical case, but must occasionally, and as to the evolution of gas, frequently, occur. If there be gas in the mine, it is expected at the goaf: gas does come from the goaf. All working at the goaf, except with safety lamps, is forbidden: the seams in mines are usually more or less inclined; and this mine at Haswell, where gas *has come* from the goaf, is very free from gas, and well ventilated, as compared with other pits.

There is one other point connected with what may be called the action of the goaf, and the occasional sudden and temporary discharge of gas from it. One of the witnesses on the inquest, Mr. G. Hunter, pointed out the effect he had observed in the mine on a change in the barometer:—that as the barometer fell, fire damp would tend to appear, and that it did this the more suddenly and abundantly, if the barometer, having continued high for some time, fell suddenly: and Mr. Buddle has already strongly stated his opinion that accidents from fire damp always occur with a low barometer. This is very natural; for during a high barometer, the fire damp, tending to escape from the coal and strata, would be in some degree pent up or restrained by the pressure of the atmosphere; and the diminution of pressure indicated by a sudden fall taking off this restraint, would let the gas expand and escape more freely, and hence its more abundant appearance. Now, without reference to the fire damp which would ooze out of the strata and from the surface of the goaf basin, let us for a moment consider what would happen as respects the gas already free, but held by its small specific gravity in the upper part of the basin. The barometer will sometimes sink an inch in twelve hours: on such an occurrence, any portion of air or gas pressed on merely by the atmosphere will expand about one-thirtieth part in that time. The portion of air or gas contained in the inverted basin of the goaf is, as has been said, equal to the volume of coal withdrawn beneath, as long as the surface of the country above has not sunk, but, because of the inclination of the coal seam, which we may for the present assume as that at the Haswell Little Pit, the air space which is above the level of the highest point of the edge of the concavity may be taken for illustration, as four-fifths of the bulk of the coal, or four-fifths of 13 acres by a thickness of 5 feet (2,265,120 cubic feet); of which the one-thirtieth part, or 75,500 cubic feet, will by expansion be driven below the level of the highest point of the goaf basin. If it contain any portion of gas, it will by its lightness begin to flow out at that particular part; if it contain much, it will flow out the more rapidly, and be the more dangerous; and if, in a mine much infected with fire damp, it be an explosive mixture, it is easy to imagine that such a cause may occasionally bring about most fatal results.

A fall of an inch in the barometer, of a sudden, is rare, but a fall of one-tenth of an inch is not, and that in such a goaf as the one supposed would place 7,550 cubic feet below the edge of the cavity; this all tends to issue forth at one place, and that generally a place where the ventilation is weakest. If, as an influential circumstance tending to diminish the quantity of issuing atmosphere, we assume that the country above has descended, so as not to leave more air space in the goaf than one-fourth of the volume of coal removed; still that would permit 1,887 cubic feet to issue forth at one spot, on the occurrence of a fall in the mercury of the barometer equal to one-tenth of an inch. Hence it does appear to us that the goaf, in connexion with barometer changes, may in certain mines be productive of sudden evolutions of fire damp and explosive mixtures, and that the indication of the barometer, and the consequent condition of the mine, ought to be very carefully attended to.

The recent terrible event appears to have originated at the Meadows Flat workings, at a point near to the upper edge of the goaf concavity, at a place where a *jud* was in the act of being drawn. A man of the name of Williamson, and other men were engaged in this work at the time of the accident; all were killed, and the jud has since been named after Williamson. All the evidence derivable from the way in which the stoppings were blown, the charring of the posts, and the adhesion of charred coal dust to them on this or that side, as also to the walls of the mine and edges of the irregularities of the walls confirm this view in the opinion of practical men, the viewers of the mines, and with this conclusion the results of our own close inspection perfectly agree. At this place Davy lamps were found. The state of the gauze indicated that they had been in good condition prior to the accident, but two of them were much crushed and bruised, and one of the others had the oil plug out; this and the fourth were probably found lying on their sides, for the oil was out of the bottom part of the lamps, and had soaked into half the gauze along the cylinder, as they may have lain on the ground. We could get no exact evidence as to how the lamps were in respect of position and other circumstances when found. The gauze of one of these lamps had been heated all round for about two inches from the bottom, as if fire-damp had been burning inside at that part of the cylinder; and there was also on the side of the upper part of the gauze of the same lamp, an oblong spot of oxidation exactly such as would have been produced at the first entrance of increasing fire-damp into the lamp, and consequent elongation of the flame, supposing the lamp had been placed a little obliquely against the wall of coal or any other upright object. These appearances accord perfectly with the idea that fire-damp came into the workings whilst this lamp (which had been given out that morning perfect) was there and in use.

(To be continued.)

ON THE PROTECTION OF DRESSES AND OTHER MATERIALS AGAINST FIRE.

There are few subjects more worthy of the attention of chemists, than the power some salts have of enabling bodies to resist the action of flame. Scarcely a week passes without some fearful accident being recorded, and though the improved architecture of our streets, the great activity of the fire brigade, and the free supply of water, would appear as efficient guarantees against a repetition of that fearful calamity, the destruction of London by fire, yet from the extreme combustibility of the materials employed by builders, when once the fire has obtained some power, the destruction of the house attacked appears, in nearly every case, to be complete. Lately, however, attention has been more strongly directed to affording some protection to the gauze and other dresses worn by ladies, in consequence of the late fearful accident, by which the stage has been deprived of one of its most promising ornaments—and what rendered it more terrible and striking, was the occurrence before a crowded audience.

It was our painful chance to have been in the stalls that night, and to have witnessed, even to the minutest particular, that fearful scene. Blame has been imputed that no assistance was given, and that a young and interesting girl should have thus been sacrificed, while hundreds were looking on; but it should be at the same time remembered, that iron railings and the orchestra would require to be passed, and that individuals would naturally feel that repugnance to come before the curtain to which this girl was sacrificed; and we think it may be with truth added, that had the name of the victim been known, a greater alacrity would have been displayed. The scene in the "Revolt of the Harem" is of course known to all, in which the principal dancers are represented bathing in the Royal Baths. Miss O'Brien was from some trifling cause absent, and Miss Clara Webster and Madlle. Plunkett were alone; this allowed probably more freedom to the graceful movements of the dancer, and her light gauze dress floated over the unguarded lamps. Mrs. Payne at that moment came forward as the slave, and her scream first called attention to the fearful scene. The life of this unfortunate girl was then in her hands, her dress was barely on fire, and as Miss Webster was leaving the bath, to have either torn it away, or instead of screaming and running away, to have thrown her forward and have stamped out or covered up the flames, would have been attended with no danger, as the dress of Mrs. Payne was of cotton. But such was the want of presence of mind of those trained to the stage, that without one effort made to assist her, Miss Webster struggled on to the stage: but it was like the hare upon whom a stoat had fixed, screaming and treading as if afraid to move, nor was it till the flames had done their worst, and till little remained for them to burn, that the unfortunate girl staggered to the side, when assistance was at length given by a carpenter. This man we saw watching her from the side, and to this moment, we are utterly unable to understand how, after the scream of Mrs. Payne, this man, or the frequenters of the ballet then behind the scenes, with their kid gloves and military cloaks, should have remained spectators of so fearful an occurrence: fear it clearly was not, the man we marked seized her without hesitation, and others saw him dash out the sparks with his naked hand, and thus burn himself in a vain effort, when he could at the commencement have afforded the same assistance with a certainty of success, and without the slightest risk. Mr. Payne, immediately after the accident, informed the audience of the name of the sufferer, that she was, however, but slightly injured, and that assistance was being then given to her; the spectators became instantly satisfied, and the performance again commenced, Madlle. Plunkett, with her dress burnt in several places, performing a pas seul; indeed, among the élite of the stalls, we heard those who had the entré behind the scenes repeating the tale of Mr. Payne, but no one at all conversant with the power of flame, who witnessed the accident, could for a moment have entertained any hope.

At the inquest, the power which chemical compounds can exert of protecting bodies from flame was exhibited by Mr. Wakley; pieces of gauze were burnt, and the newspapers regarded it as conclusive; but these compounds, which have been long known, can have but a very limited effect, they can have no power of controlling the affinity of carbon and hydrogen, which constitute the fabric, to unite with oxygen, and they can only act by glazing, running as it were into a glass, and thus shielding the fibres from the air. The flame of phosphorus shows this action very distinctly: it is very difficult from this cause to light paper with it, the phosphoric acid formed during the combustion, settling on, and glazing the paper; but the dress, to be at all efficiently protected, must be saturated with the salt, which, mixing with the perspiration, would not only render it extremely disagreeable to wear, but would give it a crispness and stiffness, utterly destructive of the graceful wave and fall of the dress of the dancers, which add so much to the attraction of the ballet. In those scenes where at all a near approach to fire is made, as in pieces of diablerie, it would really appear but an indispensable precaution, that the first dancers, who are the most necessarily exposed, should use dresses of silk gauze; the expense would be somewhat greater, but the fabric would not for a moment hold fire, while it far exceeds the cotton gauze in softness and elegance; it is, however, to the introduction of a new and cheap fabric we must alone look; and there are several substances which the ingenuity of our manufacturers, we are convinced, could render available. All woollen fabric is peculiarly incombustible; and a gauze, we have no doubt, could be made from it. Asbestos would be, we fear, from its expense unavailable; yet this mineral resists in the highest degree the action of heat. To clean it we are in the continual habit of throwing it into the fire, the impurities are burnt away, and it recovers immediately its natural whiteness. Aldini proposed the manufacture of dresses of this material for the fire brigade; he availed himself, in addition, of the power which wire gauze affords of stopping the passage of flame: a man we saw thus protected pass unharmed amidst heaps of burning straw, occasionally even hid from view by the sheets of flame. Colonel Mayne considered it, however, too cumbersome a dress for general service; but some portions of the dress could evidently be adopted with advantage by the fire brigade; in place, for example, of the heavy and ineffective helmet, one prepared of light wire gauze, fitted with a vizor and light lining of flannel, or any nonconducting substance, would be a great protection to men so continually exposed to be surrounded with flames. The repeated accidents to the men would show the necessity for some additional protection; with this visor they could bear for many seconds what would now be a fatal atmosphere. Though the helmets may give the brigade a military appearance, yet it is of all things the most unsuited to resist blows from falling bodies, and being metallic, and therefore a perfect conductor of heat, would cause inconvenience, where but for this ill-judged protection it would not be felt. The power of steam might be also introduced in the pumps with advantage. Though the use of the various salts particularized on the inquest, as alum and common salt, are clearly, for the reasons we have pointed out, inadmissible, and the more powerful, the silicate of potash and phosphate of ammonia, which afford a much higher and effective glaze, would in a more limited degree be open to the same objection. The fabrics would be in addition very soon destroyed; if alum was used, the first washing would find them full of holes. There is still reason to hope that by the use of some chemical substance before the cotton is worked up, it may still be in our power to prepare a gauze which after washing should be incapable of burning with flame. By soaking in a solution of corrosive sublimate, vegetable fibre appears to undergo some considerable chemical change; the results on destructive distillation are very different, nor is there the same quickness of combustion. Insects can no longer injure it, and it is able to resist that peculiar action of decomposition called dry rot, and the introduction of it into ships, or for houses, is certainly well worthy of particular attention. For theatrical purposes, it would be sufficient to invest the police with the power of removing every unguarded light. A slight protection of wire gauze would, as a thousand experiments have proved, be a most effectual guarantee against any recurrence of so fearful an accident; indeed, if the jury had not felt the impossibility of fixing a deodand which legal sophistry could not set aside, they would probably have punished the neglect in this instance. It is indeed strange, on going behind the scenes, to see every light entirely unguarded, though surrounded by the most inflammable materials. The foot lights would appear certain to catch the dresses of the dancers, yet they are left quite open; a line of wire gauze above them would even improve the effect, and as it could be fitted for a few shillings, we trust that this will at least be adopted: some slight instruction might also be given by which the performers would throw themselves down and beat out any fire with their hands. Men in some distilleries have spirits of wine thrown over them and fired, to give that presence of mind in case of accident; and the Ceritos and Taglionis might trust themselves with the most certain confidence, in any scene to the beautiful silken gauze. To render wood incombustible, is a subject of almost national importance; it can now be partially effected by a strong solution of corrosive sublimate, and by the direction which public attention has received, further trials will doubtless lead to the discovery of some more effective and less objectionable solution. However dreadful fire may appear on land, on sea it is peculiarly terrific, there is then no escape; and the great perfection to which experiments have been carried on in France with percussion shells, render it certain that unless some measure of precaution is taken, our ships, in the event of a war with that power, will probably be on fire after the first discharge of these terrific missiles. This calamity may be nearer than we expect; the recent correspondence of the two Governments published, shows that but for the prior resignation of his official situation, our own Government had at one moment determined to send Mr. Pritchard back on board a line of battle ship. We know not how soon a hostile collision might be brought about, and all the horrors of war accumulated upon us. Glorying in our embarrassments, forgetful how much they must be themselves exposed, we find the American papers gloat upon the idea of firing our dock yards.

This protection by chemical agents against fire, has in England received but a passing attention; in France, a committee was appointed, but their report is incomplete. They found, as might indeed have been anticipated, that those salts which absorbed water, and were always therefore damp, resisted most strongly the action of fire; salts of easy fusibility, as the phosphates and silicates, were next tried, but not the action of the metallic salts. Now it is evident that the mechanical protection of a solution on the exterior, must be for all practical purposes useless, but corrosive sublimate appears to enter into a chemical combination with the wood, forming some comparatively speaking inert substance. We have marked repeatedly, in proof of this, the giraffes in Regent's Park, licking the wood. Indeed, without some such compound was formed, it would be impossible to have used the prepared wood in shipbuilding without salivating the crews. The withdrawal of the air, and then the application of strong pressure would probably force the solution deeper into the interstices, and thus give the solution a fairer chance.

We remember a peculiarly ingenious application of the phosphate of ammonia to prevent those accidents which so continually occur from the sparks remaining in the gun after each discharge. The case of the two gunners who perished at Portsmouth during the salute to the King of the French, arose from this cause. It was conceived by the inventor, that bags saturated with phosphate of ammonia would either retain sufficient firmness to be expelled with the ball, or that the sparks would at least be prevented. Twelve calico bags thus prepared were fired by Sir Thomas Hastings from the Excellent at Portsmouth, and after every fire the gun was carefully examined by that distinguished officer; an equal, if not a greater number of sparks than from the regular bags of the service was seen after each fire. The salt prevented the flaming, but did not prevent the after combustion. When flannel cartridges are used, these sparks are very rarely seen, nor is there any record, we believe, of an accident during their use.

By the adulterations practised in some trades, the combustibility of some bodies is greatly affected; this is particularly the case with brown paper; it used formerly to be in request among servants for lighting fires, but since the manufacturers have prepared it with glue and other materials, in addition to rags, it possesses that solitary advantage over the genuine, of not burning: to consume a sheet, it would be necessary to continually relight it, while formerly it burned from the smallest point, and a few drops of water were not sufficient to reduce it, as at present, to an useless pulp.

There is a class of property peculiarly susceptible of injury from this cause—the produce of our farms, which are necessarily so exposed to the hand of an incendiary. Ricks, it has been proved, can be greatly preserved by the addition of salt during the stacking; the hay thus seasoned, is found to be more palatable and healthy to the cattle, and if the straw used for thatching were rendered incombustible by a coating of glue and some incombustible salt, the tendency of the fire to spread so rapidly from one rick to the other would be in some measure prevented. There is another cause of fire, probably not sufficiently guarded against. Chemical combinations producing sufficient heat to cause ignition. Linseed oil and sawdust will nearly invariably do this, and guano, when wetted with sea water, has thus lately fired some vessels. Hay when packed up wet, is certain to fire; salt prevents in some measure this change in hay, and if mixed with guano would not only give an additional security, but would prevent that deterioration of this valuable manure during the voyage; that it does suffer, is proved by the effluvia of which the sailors complain so much.

In conclusion, we have to observe that at the moment of so fearful an accident, it is possible that both by the managers of theatres and the performers sufficient care will be taken to avoid a recurrence; but unless additional cheapness were joined to the incombustibility of a fabric we fear it would not be permanently adopted. The idea of employing salts as a protection is utterly untenable, but the Lord Chamberlain might, in so strong a case at least, exercise his authority, and refuse his sanction to performances of the slightest danger unless the lights were protected by the cheap and effective wire gauze.

EXPLOSION OF THE HASWELL COLLIERIES.

Report from Messrs. Lyell and Faraday, on the Explosion of the Haswell Collieries, and on the means of preventing similar accidents.

(Concluded from p. 80.)

At this place the men were drawing a *jud.* It may be that fire-damp issued into the workings there independent of any thing the men were doing, or it may be that in the falls of the roof (for it had fallen, as was evident by the stone and timbers,) they broke away a portion of the upper edge of the goaf concavity, and by that, both let out explosive mixture into the works, as before explained, and mechanically mixed it up with the air beneath. This issue of gas would not of itself have caused the explosion if the lamps had been right; but of these lamps there are now three that might have fired the gas, for two of them are so bruised, that if these bruises were occasioned by a fall of stones either before or at the time of the issue of gas, then the gas may have taken fire at them; or if they were not bruised by a fall before the explosion, but by one consequent upon it, then it is possible (though not probable) that the third lamp, with the oil plug out, may have occasioned the firing.

When once the combustion began, even though from only a small quantity of gas sent out of the goaf, it would instantly reach up into that greater portion within the goaf vault, and we believe that it was the inflammation of this large portion which gave such force to the blast as to blow down the stoppings between the Meadow and High Brockley Whin workings, and to reach so far as to the goaf of the latter works. Here, from the appearance of the posts and walls, and also from the burnt bodies found, it would appear as if the fire damp in this goaf had been driven out, mixed with air and inflamed; a very natural result of the circumstances.

In considering the extent of the fire for the moment of explosion, it is not to be supposed that fire damp is its only fuel; the coal dust swept by the rush of wind and flame from the floor, roof, and walls of the works would instantly take fire and burn, if there were oxygen enough in the air present to support its combustion; and we found the dust adhering to the face of the pillars, props, and walls in the direction of, and on the side towards the explosion, increasing gradually to a certain distance as we neared the place of ignition. This deposit was in some parts half an inch, and in others almost an inch thick: it adhered together in a friable coked state; when examined with the glass it presented the fused round form of burnt coal dust, and when examined chemically, and compared with the coal itself reduced to powder, was found deprived of the greater portion of the bitumen, and in some instance entirely destitute of it. There is every reason to believe that much coal gas was made from this dust in the very air itself of the mine by the flame of the fire damp, which raised and swept it along; and much of the carbon of this dust remained unburnt only for want of air.

At first we were greatly embarrassed by the circumstance of the large number of deaths from choke damp; and the evidence that that had been present in very considerable quantities compared with the small proportion of fire-damp, which, in the opinion of those in and about the works just before, must have occasioned the explosion. But on consideration of the character of the goafs, as reservoirs of gaseous fuel, and the effect of dust in the mine, we are satisfied that these circumstances fully account for the apparent discrepancy. The blowing down of the stoppings, by destroying the ventilation of the mine, caused all this choke damp to be left for a time in the workings; and there is reason to believe, from the circumstances, that the men met with a death comparatively sudden.

With such views of the character and effect of the goaf as we have ventured to express, and with a strong belief that it has been the cause of the recent sad event at Haswell, it will not be thought surprising that, in thinking of the means of preventing such calamity in future, we should turn our attention almost exclusively to it. The first idea is to ventilate the goaf.

If a shaft could be sunk over the crown of the goaf, it might perhaps carry away all the fire damp; but the probability is that where furnaces are used in the upcast shaft, *that* over the goaf would become a downcast shaft, so that all the fire damp evolved into it would have to pass into the mine and out with the ordinary ventilation. Besides that shafts of such magnitude are very expensive, the bottom part would be liable to fall in; the crown of the goaf vault, also, is in many cases probably changing its place continually, and in inclined strata it might easily happen in the course of working that the bottom edge of the shaft would soon be below the upper edge of the goaf basin *in* the mine, when it would be of comparatively little use. These are difficulties and objections which occur to us even in our theoretical considerations: whether practical men would set them aside, or whether they would add to their number, we cannot say.

Another mode of action has occurred to us, which, the more we think of it, seems the more practical, and offers greater hopes of service to humanity, and which, therefore, we shall venture somewhat minutely to explain. It is founded on the principle of drawing away the atmosphere in the goaf, not of ventilating it by blowing air into it; it is better in principle than blowing into the goaf, because it proposes to take away the fire damp in a concentrated form, and never to give it to the air of the workings; whereas blowing would first dilute and expand the gas, andthen throw it into the works. The difference is especially important for mines where the gas is abundant; for suppose for a moment a goaf cavity full of fire damp, and an apparatus that could either blow into it or take from it an equal quantity in each case, of air or gas; to take out one cubic foot of fire damp would be to prevent the formation of from six to fifteen feet of explosive mixture; to drive in one cubic foot of air would be to send an equal quantity of fire damp by displacement into the mine, there to form, at one moment or another, from six to fifteen feet of explosive mixture, which would afterwards have to be carried out of the works by the usual mode of ventilation.

In the first place, we propose that the pillars and juds should be so worked and drawn as to have reference to the form which it is desirable to give to the goaf. This form must be dependent on circumstances, but the point required is that it should draw together at its termination in the upper part of the works, *i. e.*, that as the strata rise, the goaf should not have several projections or bays, running independently into the higher works, but one only where the highest point of the goaf basin may occur, and towards which all the fire-damp in the goaf may drain and tend to run under. It is as if in making a pond on the side of a hill,—there should not be two or three low places on the bank where the superfluous water may run over, but one only, *that* being the lowest, as in the fire-damp case, it would require to be the highest. This condition would probably be obtained with facility by continually keeping one jud drawn in advance of the rest; and the inspection of a working plan with the inclines drawn on it would easily determine, in every case, what should be done. The next point is to drain or clear this place as well as may be of its fire-damp, which if it could be done effectually, would, in all probability, prevent danger from the goaf, if not absolutely, yet to an extent far beyond what is the case at present; and for this purpose two plans suggest themselves, the same in principle, but differing in extent.

The first plan consists in laying a pipe from the goaf to the upcast shaft, introducing the one extremity into the vault of the goaf at the upper edge of its brim, and furnishing the other extremity with necessary means of drawing the air out of the pipe. The pipe itself may be of cast iron in lengths, joined together with sockets and caulked joints, or in any other of the many well-known manners; its diameter may be about twelve inches, until experience may have directed some other dimensions. Its place, for the chief part of its course, would probably be in the return way; for it ought to be tight, having no other opening than the two extremities; and in the return way it could be best examined from time to time, and would be safest from the effects of creep.

The exit or upcast end of the pipe is to be supplied with means of draught or suction; this might be either a blowing cylinder, or a rough box double bellows, or a revolving fanner, any of which might be worked by the engine, or even by a man or boy, for the work would be easy, there being no resistance to the exit of the air analogous to that offered by the contraction of the stream of air in the ordinary use of blowing machines. But even these are, in our opinion, not required; for from the powerful draught in the return of the Haswell Works, we are at present fully persuaded, that if the goaf ventilation pipe, of the size proposed, simply entered the upcast shaft, there would be draught enough to draw away the atmosphere of the goaf. It is true, that if the atmosphere in the goaf vault, to which the end of the pipe might penetrate, were pure fire-damp, we should have to consider its lightness, and the vertical height between that extremity and the end in the upcast shaft. But this probably is a state of things which could happen very rarely, if ever, in the Haswell Pit; explosive or still lower mixtures, there and in most cases, are rather to be expected, and these, as has been shown, are not so much lighter than air as to offer difficulty in this respect. If a case of pure fire-damp, or a mixture so rich as to offer difficulty on account of its lightness, were to be reached by the pipe, then, indeed, it would be well worth putting on the mechanical means already referred to, to drain it out.

The goaf end of the pipe offers more difficulties, but we do not see at present that there are any that are not easily surmountable. It has to rise up into the cavity of the goaf, at the point nearest to the highest part of its edge; to enter into this cavity, four, five, or six feet, or even more, if possible; and to be temporary, moveable, and tight. The iron tube may in the first place be continued from the upcast shaft, by any course which, on consideration of the works, may be thought most expedient, towards, and within a certain distance of, the draining point of the goaf, as near to it as is practicable, probably to within fifteen or twenty feet. From thence the pipe may be continued, by wooden trunks fitted together temporarily, having the same sectional area as the pipe itself; and where the pipe rises in the cavity of the goaf, it does not seem difficult to fix wooden adjusters together, either square or round, the joints of which may be made tight by a little mortar. It is even probable that the upper extremity of the pipe might be a tube of air-tight cloth kept open by rings, and raised into its place from a safe distance by a rod of iron or wood. In all cases this end of the tube should be fully open, not allowed to collapse or be contracted in any part; and the joints, if adjusters are used, should be in the direction which opposes least resistance by irregularities to the passage of the air: the roof should of course be propped up as much as may be required about this end of the pipe to protect it; the character of a fixture being in some degree given to the arrangement, until such time as it is again necessary to extend the goaf in that direction.

The second plan which we propose is of the same nature, but more local in its arrangement. In this plan, we contemplate carrying the exit end of the drainage-pipe only into the return way, but into a part where there is such current of air that the goaf gas thrown in is sure to be thoroughly diluted and carried away. It ought not to be near the furnace, lest at any time there should be gas enough to take fire at the furnace, and communicate explosion back through the pipe into the goaf.

The goaf termination of the pipe will be as before. But in some part of the course of this pipe is to be placed a blowing apparatus, either bellows or fanner, as before directed, drawing from the goaf, and blowing towards the return way. The apparatus may be placed in any convenient part of the course of the pipe, but would probably be more effectual, the nearer it were to the goaf, as there is then the chance of fewer leakages between it and the goaf. It would probably have to be worked by a man, or by any power that was available; whether the draught into that part of the return where the goaf pipe entered, would be sufficient alone or not, is a point which must depend on the nature of the works, and must be determined, if determined at all, by experience.

Such is the general plan, which, with some degree of confidence in its principles, we venture to submit to practical men for their consideration; and we do it with more readiness, believing, from the spirit which we have seen manifested at the Haswell mine, that they are earnestly desirous of carrying into effect everything that can be practically useful. The effect of it would be to remove that condition of the goaf atmosphere, which ordinarily exists at the upper edge of the goaf basin, to a distance of four, five, or more feet higher up within the basin, so as to allow abundant space for all the variations of this atmosphere, without the underflowing of any explosive, or perhaps even contaminated, portion of it into the mine. In the case of a regular mine working downwards or into deeper parts, there does not seem much difficulty of application, since the highest edge of the goaf is there stationary. Where the pitmen work towards the rise or upwards, as is the case at the Haswell Little Pit, then the goaf end of the pipe must change its place from time to time. Where faults occur, and the mine is irregular in its workings, each case must be considered by itself, and met, if it can be, upon the same principles. The more faults there are in a mine, the more difficult it may be to regulate the place and form of the upper edge of the goaf cavity; but on the other hand, the more faults there are, the more fire-damp is there generally in the workings, and therefore the more occasion for some means of obtaining the end proposed. If, as is manifested by the Haswell Pit, mines considered the most safe and best ventilated need some such means, how much more must others require it?

Supposing that such a ventilating arrangement as that proposed were established, *another place* for examination would be at the exit end of the goaf ventilation pipe. Ordinarily, we trust, but little gas would be found there, because of the effect of the continued drainage by the arrangement. But this examination, like all others, should be made with every care, lest upon any sudden evolution of gas, or fall of the barometer, an explosive mixture should be issuing forth, and this by a naked light, if such were used for the examination, communicate combustion to the goaf gas through the pipe itself.

Both in the mines, and at the inquest, our attention was called to the *stoppings* and *doors* in the workings, upon which the course of the general ventilation depends. When these are blown away by an explosion, the ventilation is altered, and at times, as in the Haswell Pit accident, entirely withdrawn. Mr. Buddle proposed to have dam doors so arranged, that when the stoppings were thrown down, these should come into action. We do not think that it would be impossible, or even very difficult, to carry such a plan into effect in some of the permanent ways of the mine; but, considering that if the stoppings were not blown down, the probable effects after an explosion would be the firing of the mine, and also that Mr. Buddle did not himself work out his own proposition in the many mines where he had power, we are not prepared to say that it is a matter that can be brought into practice, and ought to be enforced, or to give any opinion on the subject.

We perhaps ought to apologize for this lengthened statement, especially as we have no right to assume that we have that kind of knowledge that can be gained only by practical men; but we have been encouraged to proceed by the hope of being useful; and have endeavoured to write this Report, not in technical phrase, but in plain and simple language, which, if useful in its suggestions, may be comprehended by all.

In conclusion, we cannot but express a hope that some step may be taken without delay, with a view to afford a better education to the persons engaged in working in collieries. When attending the late inquest, we were much struck with the fact that more than half of the pitmen who gave evidence, some of them persons of great intelligence, and one master wasteman, were unable to write, or even to sign their names as witnesses. The best conducted and well informed from amongst the pitmen, are occasionally promoted to some of the subordinate offices of charge in the mines; and it would be in the highest degree useful, if greater facilities were given to the underviewers, overmen, wastemen, and deputies, to learn the elementary knowledge more immediately bearing upon their business. They might be taught, for example, such simple parts of chemistry and pneumatics as relate to the nature of gases and air; the first principles of hydrostatics and of geology, as far as concerns the position and dislocation of strata, the intrusion of trappean or volcanic rocks, and other points.

In countries such as France and Germany, where a far less amount of capital is embarked in mining enterprises, there are large schools of mines and scientific establishments, in which professional men, of different grades, are carefully instructed in those branches of knowledge which are closely connected with the art of mining. We are aware that, notwithstanding the want of such institutions, viewers in this country combine a large amount of scientific information with great practical experience. But such qualifications are enjoyed by a comparatively small proportion of those engaged in the superintendence of coal pits, especially of that class to whom the subordinate offices are entrusted[a]. If peculiar difficulties attend the organization of schools for the mining population, owing to its migratory habits, and because the workpeople are often congregated suddenly at places far distant from towns and villages, and do not remain permanently resident at fixed points, it is the more necessary to endeavour to overcome these obstacles; and provision might, perhaps, be made for appointing teachers, whose duty it should be to visit, in succession, the different localities where the large pits are opened from time to time. Among the many thousands whose thoughts are now continually engaged in the coal mines, there will be always some individuals of strong natural powers, who, if they had mastered the elements of the sciences above enumerated, might be enabled to invent new methods, or at all events would be far more capable than persons unconnected with the business, to appreciate the dangers to which they are exposed, and to judge correctly of the adaptation of philosophical principles to practice. We believe, therefore, that if the education of the miners generally, and especially of those set over them, can be materially raised, it will conduce to the security of the lives of the men, and the perfecting of the art of mining, more effectually than any system of Parliamentary inspection which could be devised.

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[a] In the present state of science it is unworthy of the viewers and other mining agents that the nomenclature employed by them in the description of rocks should neither be intelligible to the geologist, nor uniform in neighbouring mining districts. Such terms as *post*, *metal*, *whin*, *splint coal*, *mild* and *strong*, *thill*, *scares*, *girdles*, and others used in the original of the Section copied for this Report, are illustrations of the strange phraseology which prevails, and which cannot easily be interpreted, even where the miner attaches a definite meaning to the terms he uses.

There is no reason to fear but that the owners, and all the authorities, high and low, would combine with the men in enforcing regulations for the application of scientific principles to practice, if their minds were prepared by instruction to estimate the true value of the new methods proposed, and if by that instruction those prejudices were removed which disincline the ignorant to every change of system.

There are here no conflicting interests to contend with, for the proprietors are always anxious to prevent explosions and accidents, not only by their feelings of humanity, but by a regard to the property they have at stake; while the viewers, underviewers, and other officers, are continually risking their own lives, and share in every danger with the men.

We have the honour to be, Sir,
Your obedient humble servants,
M. Faraday,
Chas. Lyell.

ON THE NATURE OF PYROGEN.

Continued from p. 11.

By John Joseph Lake.

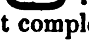
From some cause, which I have not yet been able to discover, there seems to be a remarkable affinity between oxygen and pyrogen; for where the one is found, the other is rarely, if ever, absent. The reverse, however, seems to be the case between pyrogen and hydrogen.

Water is the medium by which many chemical substances amalgamate, or are decomposed and new forms of matter produced. Many bodies may be placed together, ground together, and every device adopted to produced chemical action among them in vain, but let only a little water be introduced, and immediately the desired effect is produced; the substances are in part, or entirely, decomposed, and the matter of which they consisted assumes altogether different forms, and acquires different properties.

Pyrogen acts in a similar manner, and by its abstraction or introduction chemical action takes place. Thus it is found that by discharges of it in common air nitric acid is produced; and when mercury is placed in contact with a solution of ammonia, and negatively electrified, that is, the pyrogen drawn from it, it expands in volume and becomes a soft solid. But the pressure of pyrogen, which returns to it on breaking communication with the galvanic battery, destroys the affinity between the mercury and ammonia. Therefore, when the product of this experiment is exposed to water, the latter is decomposed by it, giving out hydrogen, whilst the former absorbs oxygen and pyrogen, leaving a solution of ammonia and mercury. If exposed to air this is also decomposed, and oxygen and pyrogen absorbed.

Potassium, sodium, calcium, barium, strontium, and many other bodies, are obtained by the abstraction of pyrogen from their oxides, by which means the affinity between them and oxygen is destroyed, and they separate. But, as in the case of the amalgam of mercury and ammonia, and from the same cause, as soon as they are exposed to air or water, they absorb oxygen and pyrogen, and return to oxides.

The chemical affinity of pyrogen and oxygen appears to be less with ammonia than potassium, sodium, calcium, barium, strontium, and some others; for when any of these are united as an amalgam with mercury, and exhibited in this state to ammonia, an amalgam of mercury and the bases of ammonia is formed, and the fixed alkalies or earths are reproduced, the first amalgam having absorbed the pyrogen and oxygen of the second[a].

A peculiar property appears to attend the abstraction of pyrogen, namely, the generation of heat, which in a galvanic battery proceeds from the negative pole. This is proved by the ingenious experiment made by Messrs. Pollock, Gann, and Mackrell with a glass tube bent thus,  . An acid solution being poured into it, and the circuit completed by bringing the terminal wires of the battery into it at each opening of the tube, the fluid becomes quickly in a state of ebullition, commencing at the negative and proceeding towards the positive electrode, invariably following this course, whichever wire is first brought into the solution. These gentlemen also tried another experiment, which my occupations have hitherto hindered me from repeating, and with a similar result. An Eau de Cologne box, pitched inside, and having two cards placed transversely as diaphragms, was employed. A thermometer standing at 59° was placed in the positive cell, and another standing at 58° in the negative. The connexion being made with the battery through these cells, and continued for ten minutes, the thermometer in the positive stood at 65°, and in the negative at 68°, the former having risen 6° and the latter 10°.[a]

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[a] See Sir Humphrey Davy's "Electro-chemical Researches on the Decomposition of the Earths; with Observations on the Metals obtained from the Alkaline Earths, and on the Amalgams procured from Ammonia."—Philosoph. Transact. 1808, Part II.

In a paper written by me, and published in the Polytechnic Review[b], it is shown that evaporation, especially between the tropics, forms a kind of galvanic circuit, the rising vapours [c] carrying with them a large quantity of pyrogen into the air, which, on their condensation, must flow to other regions, or disperse itself in lightning, or some other way; and that its place is supplied by more which is constantly flowing from the north and south to the spot over which the sun is vertical. This locality, being in a negative state, is, in principle, the negative pole of a battery. It is also shown that the central parts of the earth are in a negative state, that is, that there is a deficiency of pyrogen' or electricity in them; these, therefore, act on a similar principle as the negative pole of a battery.

By applying the above experiments concerning the development of heat to this theory of the pyrogenic or electric state, and currents, of the globe, we have a singular explanation of the cause of subterranean heat; the central parts being as it were the negative pole, from which the further we recede the less warmth is found, until at the mountain tops, there is, in many cases, perpetual frost. It may also be inferred that *a portion* of the heat of tropical climates, and indeed, of what is known as *solar* heat all over the world, has the same origin. I am not prepared to say that *all* solar heat results from the operation of these principles; but one thing is certain, which it may be worth while to observe *en passant*, that the rays of the sun are not *essentially* warm, though they develope heat when they come in contact with solid bodies. If they possessed warmth in themselves, they would communicate it to the upper regions of the atmosphere in passing through it.

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[a] Proceedings of the London Electrical Society, 1841 and 1842, p. 6.

[b] May, 1844, p. 263.

[c] Mrs. Borron states that the evaporation is " so much as nearly half an inch from sunrise to sunset," in lat. 10° N., at sea.—Polytech. Rev., Aug. 1844, p. 127.

HISTORY OF WEAVING.

The Art of Weaving by Hand and Power, with an Introductory Account of its Rise and Progress in Ancient and Modern Times, for the Use of Manufacturers and others. BY CLINTON G. GILROY. Wiley and Putnam, 1845.

THIS book (printed in America) is a most remarkable production, and if it may be taken as a fair sample of the graver literature of the States, proves that literature to be, at least, of a most original character. We have here a substantial volume of nearly 600 pages, closely printed, and illustrated by nearly 300 engravings on wood and steel, the whole giving promise of a complete and authentic body of information, historical and descriptive, on the important mystery of weaving. As far as the descriptive part goes, the reader will probably, in some cases, not be disappointed, for Mr. Gilroy is a practical weaver, and he appears to have described the various processes in his art, those at least of which he boasts himself the inventor, with great accuracy and clearness. But when we come to the historical department, and particularly as it involves the claims of other inventors than Mr. Gilroy, we find ourselves at once completely at sea,—at a loss both to understand the author's drolleries in themselves, and the practical effect which he intended them to have. One ruling feeling, however, we plainly discover running through the whole, and that is a desire to depreciate all the inventions in weaving which have proceeded from any other part of the world than the United States! (the "Britishers" in particular being most unmercifully plucked of their feathers,) and finally to shew that in the United States themselves the name of "Gilroy" stands pre-eminent as the great finisher of the imperfect beginnings of others.

A work penned in such a spirit it would be absurd to take up as a book of reference, whilst the style in which it is done is so extravagantly facetious, that we almost doubt whether criticism is at all necessary to expose its various fallacies. A few specimens will suffice. In the very outset of the introduction we have an indication of the *animus* of the author. "*Many* of our *British* weavers," he says, "*already possess sufficient skill* and dexterity in several branches of this the most complex of all arts, to prove *dangerous rivals* to those similarly engaged in other parts of the globe," &c., even in the United States. Then he goes on to tell us what has already been written on this subject, quoting a string of names which we at least never heard in connexion with this branch of industry:—"such authors as O'Doherty, Flanagan, Murphy, Ferguson, Peddie, Duncan, Yates, and Gog," but he adds, "that such writers were wholly, or in great measure, ignorant of the subject, we have demonstrative proofs in their own works." After this, we are introduced to more redoubtable authorities, namely, "the eminent German hierologist, Dr. Lepsius, now employed in Egypt by the Prussian government; Alexis Kersivenus, Civil Engineer, Homœopathic Physician," &c., who writing from Alexandria, April, 1843, gives a luminous account of certain discoveries which he has made amongst the tombs at Thebes and elsewhere, demonstrably proving that the complete art of weaving, with all its modern appliances, was known ages before the Jewish dispensation. Amongst other things of this kind, he gives the specification of a weaving engine, presented to Deioces, first king of the Medes, by "a dog from the land of Shinar, who called himself *Arphaxad.*" The memorial of the said Arphaxad, a document thirteen pages in length, is written in this style:—"O most noble Deioces! great monarch of the Medes, whose laws change not! much to be dreaded! *May it please the king's most excellent majesty*, I, an humble descendant of *our great father Noah*, have invented, arranged, and worked, after having experienced sixty-five years of sore toil and anxiety of mind in *this vale of tears*, a weaving engine to be driven by the power of compressed air, and which, O king, I now beg to explain," &c. Alexis Kersivenus concludes this and other letters with this affectionate postscript:—"P.S. My family are all well. *Cleopatra sends you her love, and three embalmed kisses, together with a vial of frankincense, and hopes soon to* * * * *."

The author, Mr. Gilroy, (or rather Gulliver,—for that we believe was the original patronymic of this marvellous gentleman,) then goes on to say:—"Had some of our modern inventors seen this loom with its various appurtenances, it might have saved them many an aching head and broken heart; and we have no hesitation in saying, that it would have effectually shewn them how far they had been anticipated by an unpretending individual who never even so much as thought it worth while to *secure* its benefits to himself by 'Letters Patent.' Although Arphaxad lived in a period of the world in which, it is generally supposed, men knew comparatively little, still we think that his specification, as delivered by himself before the Median Monarch, is scarcely to be equalled by our greatest scheming inventors and patent agents of the present day. . . . In spite of this, however, the Yankees have the hardihood to claim the merit of having invented the fly shuttle, for *one Mr. Samuel Slick*, in the year 1738; and even *Doctor Motherwell* shows his depth of learning in weaving chronology, when he reiterates the silly story which prevails upon the subject among the ignorant, in his sketch of the 'Progress of the Sheets and Blanket Manufacturers,'" &c. Again:—"*According to Pope Leo X., Jo-*

seph's coat was woven at Nineveh, by Arphaxad's loom; but this statement, although made by his Holiness, cannot be relied upon, as we find it recorded by Basharaboo, a Persian author of some reputation, that Jacob obtained the cloth 'of many colours' from one Boy Hassarac, a Babylonian pedlar."

After these specimens of incomprehensible rigmarole, which is the prevailing material of two-thirds of the bulk of this bulky and expensive volume, (a guinea and a half is the price,) the reader will be at no loss to make a fair estimate of the other wonderful assertions which it contains in regard to more modern matters; as, for instance, of Cartwright, an Englishman of "*some* reputation."

"We shall not," says Mr. Gulliver Gilroy, "in this place give any repetition of *the old hackneied story regarding the origin of the power Loom (in Europe) by Mr. Edmund Cartwright, of Marnham, Nottinghamshire* [*], and for which he obtained a patent, bearing date 4th April, 1785. It is certain that this machine would have long since passed into oblivion, had it not been for the improvements made upon it by other men of genius." (Gulliver Gilroy, for example, to wit!) To this passage the author appends the following note:—"For the true origin of power-loom weaving (plain, tweeled, and figured, of every description), see introduction to this work," referring obviously to the invention of Arphaxad!

Again, after describing Mr. Fletcher's (of Stroud, in Gloucestershire) shuttle motion, he says:—"In this loom, the yarn-beam is situated at the bottom of the framing, and the cloth-roller is placed at the top *(as in E. K. Arphaxad's great weaving Engine,* pages 24 to 41 of the introduction)."

Again, speaking of Mr. Welsh's (of Manchester) invention "for a method of producing a varied degree of speed in taking up the cloth," the author concludes his description as follows:—"The patentee says, in concluding his specification, that, 'when the lay ceases its vibrations, the whole must stop; therefore, the catch box, and spring lever, for throwing the wheels and pinions out of gear, in order to stop the cloth roller, are useless,' *to which we* (Gulliver Gilroy) *respond Yaw! Yaw! Yaw!*"

The courteous reader will, perhaps, begin to suspect that we are joking at his expense and that of Mr. Gilroy; but let him refer to page 384 of this droll volume, and he will find that we have quoted the identical words; to which, as they suggest a very ominous comment upon both book and author, we shall add nothing more of our own.

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[*] On turning to the index to see if there were any other references to the name of Cartwright, or to those of Arkwright, or Crompton, or Hargreave, or any of our principal inventors of "textile" machinery, we found that not one of them was even mentioned! Arphaxad and Gilroy had no less than a dozen or so "honourable mentions," as:—"Arphaxad, pension granted to," "Arphaxad's Loom, danger of weaving with," "Arphaxad, tribute to the memory of," "Arphaxad's Vertical Air Loom," "Gilroy's Full-harness Power-loom," "—— Improvements on Howard's and Scattergood's Loom," "—— Loom mountings or tie ups, Examples 1 to 10," "—— Muslin Power Loom," "——Patents, Infringements on," "—— Presser-harness Power Loom," "—— Varnish for treadles." And under the head of "Claims," we have only these remarkable entries, "Claims, Arphaxad, p. 28 to 33," "Bijelow's 446–479," "Gilroy's, *read the work!*"

PROJECTILE WEAPONS OF WAR AND EXPLOSIVE COMPOUNDS.

By J. Scoffern, M.D.

Lecturer on Chemistry, at the Aldersgate College of Medicine.

(Continued from p. 34.)

Had it been our intention to write a treatise on artillery, together with the manufacture of cannon, &c., the present portion of our subject would be vastly extended; such an idea, however, is altogether foreign to our views. We have thought fit to omit altogether the description of those fanciful names which were originally applied to cannon, and we do not think it necessary to describe all the varieties of this arm which are used at present in the naval and military services of this and other countries. The carronade, howitzer and mortar, however, are varieties which cannot with propriety be omitted. It is obvious, that various requisites are necessary for different purposes to which cannon may be applied. For penetrating walls, we require heavy balls moving at great velocities, the range being point blank; for dismounting cannon and slaughtering troops, longer ranges, higher angles, and smaller velocities, are more efficacious. For field service, the portability of a cannon becomes a chief requisite; at sea this is not so essential; the reader will see, then, that cannon must necessarily vary a great deal as to length, bore, and other details of construction. With such questions we have nothing to do: those who may wish to become acquainted with this subject, we must direct to systematic works. The three kinds of artillery, however, which we have mentioned, involve not merely mechanical detail, but important principles; we will first describe briefly the carronade, which derives its name from first having been made at the Carron foundry. It is a short cannon, of large calibre, made as thin as possible consistent with safety; chambered and intended to project balls or shells with small charges. Besides these essential peculiarities, the carronade is not mounted like common guns, but stands on a grooved platform. The advantages of the carronade are, that, from its exceeding lightness, it may be employed by small ships, and on their upper decks, where much weight of metal is inadmissible,—although the locality is most advantageous as an attacking position; and it requires fewer men to work it, is managed with greater rapidity than common ordnance, and on account of the small charge of powder employed in loading it[a], the ball is urged with diminished velocity, and hence with greater shattering effect. It was owing to this latter circumstance, that originally this piece of ordnance was termed a smasher. Two of the naval officers who first used them on board their ships, were Captain Keith Elphinstone, since Admiral Lord Keith, and Captain Henry Trollope, since Sir Henry Trollope, the latter of whom, by means of two carronades or smashers, which he had on board his frigate, beat off several of the enemy's, who were panic struck on seeing the size of some of the shot which he fired into them.

The *Mortar.* – Perhaps this is the most ancient of all fire artillery; although not originally applied to its present purpose of throwing shells. The mortar may be defined to be a short cannon of large bore, chambered[b], and usually fixed at an angle of 45°, adapted for projecting shells, and formerly shot. From the very nature and construction of a mortar, it is evident that whatever mathematical science can be rendered applicable to the practice of artillery, is here most especially requisite. Were we writing a systematic treatise on artillery, a minute description of the parts of a mortar would be, of course, necessary; as, however, we are merely treating in general terms of the force of explosive compounds in urging masses from tubes, all this detail will not be required.

The invention of mortars is commonly ascribed to the Germans, who are said to have employed them for military purposes in 1435, when Naples was besieged by Charles VIII.; but it is not certain whether shells were thrown out of them on this occasion. It seems, however, pretty well ascertained that they were used for this purpose at the siege of Wachtendonk in Guelderland, by the Earl of Mansfield, in 1588; in which year Cyprian Lucas described the mode of charging them[c].

At present, the largest description of mortar used in our service is the thirteen-inch; if made larger, they are difficult to transport, and, moreover, it is next to impossible to cast so large a quantity of metal without flaws and other imperfections.

Much variety exists as to the form of the chamber in mortars. The Spanish mortars have spherical chambers; the French, German and Dutch, conical and cylindrical. The Portuguese, parabolical, and the English generally in the form of a conic frustrum or cylinder.

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[a] The original charge was one-twelfth the weight of the ball, subsequently this quantity was increased to one-ninth, but disadvantageously. The carronade ball is cast exactly the size of the gun's bore, and the only allowance for windage is that diminution of size effected by the contraction of the ball during cooling.

[b] *Chambered.*—This word may require explanation. All long pieces of ordnance possess a bore of equal size from mouth to breech, mortars, carronades, and howitzers, however, are chambered, i. e. that part of their bore which contains their powder is narrower than the rest.

[c] See his Appendix to the *Quesiti* of Tartaglia.

The howitzer is a piece of artillery which is chambered, and somewhat short; in these respects resembling a mortar, but, unlike the latter, it may be elevated and depressed. It is a very useful arm, and may be applied to most of the purposes of a cannon or a mortar.

The petard is an arm much more used formerly than in the present day. It is a kind of very short gun, mounted in a peculiar way, and intended to blow down gates, &c., by being fired with its muzzle close up to them. In former times, various curious devices were employed for preventing this close propinquity between the petard and the gate, one of the most curious of which was a kind of enormous rat gin, set in such a manner as to close on the petard and soldiers applying it[a].

Having said thus much of artillery, it now remains to describe their projectiles. Mere cannon balls are so simple in their nature and uses that very little comment will be necessary. The reader is probably aware that, in the earlier periods of artillery, cannon balls were formed, not of iron, but of stone; a material which is still employed by many semicivilized nations[b]. Fire missiles may be divided into shot and shells; of the former, round shot or balls are the most simple, most commonly used, and their flight is most easily reducible to mathematical calculations; besides round shot, there are bar shot, chain shot, grape shot, canister shot, spherical case shot, and perhaps some other varieties.

Bar shot is similar to a dumb-bell, and its effects must be obvious to every one; we need not observe, however, that its flight must be very irregular, and that it is totally unadapted for long ranges; indeed so questionable are its advantages that it is now, as well as the variety next to be mentioned, no longer used in our service.

The chain shot consists of two hemispheres, joined by a piece of chain which fits into the hollow; thus the two halves when placed in opposition form one shot, which can be thrust into the gun as such, but which, on emerging, separates into two—the halves diverging to the full extent of the chain; thus this variety of shot becomes most destructive against a column of troops, or for the purpose of disabling rigging; however, it is now but seldom or never used.

Grape shot consists of a spindle or spike of metal, around which are tied or quilted several iron shot, of sizes varying according to the gun from which they are to be fired. This missile something resembles in general appearance a bunch of grapes; hence its name. Grape shot is most destructive to troops and rigging at short distances—the shots flying asunder immediately the bunch leaves the gun.

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[a] See an engraving of this gin in Hanzelet's Traités Militaires, 1598.

[b] In former times other missiles were shot from cannon. Bolts and quarrels were thus used in the reign of Henry V. (1413); these were succeeded by stones. In 1418 Henry ordered the clerk of the works of his ordnance to procure labourers for the making of 7000 stones for the guns of different sorts, in the quarries of Maidstone in Kent.—*Dr. Meyrick*, p. 118, *Anderson's Hist. of Commerce*, vol. vi. p. 351.

The canister shot is adapted to the same kind of service as the preceding, but differs from it in form: the balls, instead of being quilted round a spindle, are confined in a canister of tinned or iron plate.

Spherical case shot, or shrapnel shells as they are more commonly designated, are an important modification of the canister shot, than which they are available at much greater distances. A description of the shrapnel shell would be more intelligible had we previously described the bomb shell, which it very much resembles. It is a hollow sphere of iron, very accurately cast, and just strong enough to withstand the primary impulse of the gun which projects it. Within this shell are balls, about the size of musket balls, and powder just sufficient when ignited to burst the shell. Communicating with this powder is a fuse, which ignites by the flash of the gun, and being calculated to burn a certain time, is intended to communicate its fire to the contained powder, when the missile has reached its destination. Thus constituted, the reader may form some idea of the terrific effects of this missile. Combining as it does the long range of round shot with the scattering effect of grape and canister. Some idea too may be formed of the difficulties attending the use of this variety: how nicely must the distances be measured by the eye—how well apportioned must be the length of fuse to this distance—how well adjusted the charge of powder, &c. In fact, no variety of missile requires such delicacy of management as the shrapnel shell, but its effects are so terrific as to repay all the trouble employed in bringing it to perfection, and in its continued use.

We now come to the bomb shells, properly so called, which are understood to be shot out of mortars, but occasionally they have been rolled down inclined planes on an enemy[a], and shells of smaller description, but in all other particulars resembling bomb shells, are shot from howitzers and large cannon. The shell, from whatever piece of ordnance it may be shot, is a most destructive weapon, against which the strongest buildings rear their fronts in vain. The idea of the bomb shell is exceedingly simple, although no branch of artillery requires so large an amount of practice and calculation as that which relates to the projection of these missiles. They consist of hollow spheres containing gunpowder, which ignites by means of a fuse, as in the case of the shrapnel shell, on attaining a certain distance. From shrapnel shells, however, they differ in being much larger, thicker, and in containing no balls. They are particularly efficacious in demolishing buildings and blowing up earth mounds, against which mere shot have but little effect, as well as against troops. Instead of being filled with mere gunpowder, they are sometimes charged with a mixture of gunpowder, tallow, and pitch; then they are called carcasses, and are chiefly useful for their burning effects. Carcass shells are, however, not exactly like bomb shells, but are furnished with several orifices through which the fiery mass may leak.

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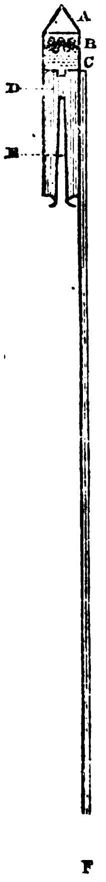
[a] The Venetians did this against the Turks at Candia.

We do not think it necessary to enlarge further on the effects of gunpowder as applied to the projection of missiles from tubes. We have studiously avoided saying any thing concerning the distance or range to which such missiles, be they shot or shells, may be cast, thinking it better to make this a consideration of itself. We now come to the description of another variety of igneous missile, in the construction of which our military artisans stand unrivalled, and which, though not absolutely invented by us, as some imagine, was, nevertheless, brought to perfection by the genius and assiduity of our countryman. The Congreve, or war rocket, being merely a modification of the common pyrotechnic rocket, it is necessary to give the reader a general description of the latter. We will first of all then allude to the principles on which a rocket depends for its *propulsive*, or in reference to the effects of inflamed gunpowder on other missiles, *repulsive* power. All are aware of the mechanical axiom that *action* and *reaction* are equal, no matter whether the agent be gunpowder or any thing else. Hence arises the recoil of a gun. Now it is not difficult to imagine a gun to be charged with a slowly burning gunpowder, so thus the recoil shall be continuous instead of instantaneous, in which case the gradually increasing force of the recoil would become a very terrific power—more terrific because, in addition to its penetrating force, it would carry with it a devastating blast of flame, rendering its whole flight visible, and terrifying and burning even where it might not touch. To those who are totally unacquainted with the nature and properties of a rocket, the foregoing general description will afford a tolerable notion: they will begin to think, however, that in order to change a gun so manifestly from its primary use, various modifications will be necessary,—various contrivances, both chemical and mechanical, must be devised. This is indeed the case; the construction even of a common sky-rocket evinces a great amount of ingenuity, and the Congreve rocket is a lasting evidence of the skill of him whose name it bears.

We shall commence with the description of a sky rocket. The case which contains the composition, a slowly burning powder, is usually made of paper rolled hard round a former, and pinched or choked at one end into a narrow opening. This case is next to be charged with composition, in doing which very peculiar management is required, inasmuch as it is found necessary to maintain a hollow cone in the very centre of the composition, the base of the cone corresponding with the vent or small orifice of the case, and the apex extending to within one diameter of its other end; beyond the apex of the cone the composition is solid. This hollow conoidal form may be effected in one of two ways: it may be made during the formation of the rockets, by means of hollow rammers and a metal spindle, or the rocket may be rammed solid, and the conoidal chamber drilled out subsequently; in either case the result is the same.

We have now described the construction of a rocket in its simplest form, without any appendage; that is to say, we have described the mere propelling agent. Whether it be made to carry with it ornamental fire-works, as in sky rockets, or shot, or shells, or carcasses, as in the Congreve rocket, still the principle remains unaltered. One more important addition, however, is necessary, or else the rocket would have no accuracy of direction, but would fly in a most irregular course; it must be furnished with a long stick, to act as a rudder or guide. A diagram, however, showing a sectional view of a sky rocket and its stick, will explain all that is necessary to the full comprehension of our subject.



A. Paper cone added to the rocket, in order that it may readily cleave the air.

B. Chamber containing ornamental stars and bursting powder.

C. Layer of clay, wood, paper, or some other substance, perforated with a hole through which the fire reaches from the composition, or slowly burning gunpowder, D.

E. Hollow conoidal cavity, for the purpose of effecting rapid combustion.

F. Guiding stick, affixed to the side of the rocket by means of wire or cord.

To fire a sky rocket, nothing more is necessary than to apply a light to the orifice or vent, when the composition immediately inflames, and fire rushing out with great violence, the rocket proceeds in the direction to which its apex is pointed.

Whatever doubt there may be as to the antiquity of guns, there is none as to the antiquity of rockets, which have been known in China and India from time immemorial, and indeed used in those countries for warlike purposes. There may be now seen at the Adelaide Gallery a Chinese war rocket, differing in nothing from the sky rocket we have just described, except that a barb is affixed to the foremost extremity of the stick, which is made to project to the rocket's very extremity[a].

Although the common sky rocket has very considerable penetrating force, and although, as we have seen, it has long been used as a warlike missile in eastern countries, yet all who have witnessed the firing of a sky rocket must at once recognise imperfections that would render it ill adapted to warfare between more civilized nations, who find it necessary to study the laws which regulate the flight of projectiles, and reduce the firing of them to some system. It is difficult to make two sky rockets exactly of the same weight; to fill them with exactly the same quantity of composition, rammed of the same hardness, and to supply them with guide sticks exactly corresponding in every particular; yet, without some close approximation in these respects, the flight of such rockets would never be prognosticated with any thing approaching to accuracy.

The first person in this country to whom the idea of using rockets as warlike agents seems to have suggested itself, was General Desaguliers, but all his experiments were failures, and eventually he abandoned the idea. Such an infelicitous termination of the inquiry, however, did not prevent Sir William Congreve from being sanguine of success: he forthwith commenced a series of experiments on common rockets, procured from various makers; and on others, constructed according to the Woolwich laboratory rules. He found, in the first place, that the range of these rockets was inconsiderable in a military point of view; and secondly, that they were devoid of all necessary accordance amongst each other—evils which he applied himself to remedy. His first material employed for making the cases was paper, but eventually he bethought himself of sheet-iron, a substance which, possessing greater weight or mass than paper, contributed much to extend the range of a rocket. Sir W. Congreve, amongst other modifications, diminished considerably the length of rocket sticks, thus rendering the whole missile much more portable, and subject to less deflection than in its original state. The sticks, at this period, in the history of Congreve rockets, were still lateral, or appended to the sides, as in the common pyrotechnic rocket—an arrangement which the slightest reflection will show must considerably have interfered with accuracy of flight, besides presenting many other minor objections; for instance, this arrangement did not admit of the stick being expeditiously fixed, neither could the rocket be shot conveniently through a tube. It was easier, however, to recognise the disadvantages attending this arrangement of the guide stick than to offer a remedy. Congreve, nevertheless, overcame this difficulty, and succeeded in devising a plan for attaching the stick centrally, thus giving the whole rocket the straightness of an arrow, and consequently increasing the accuracy of its flight; although much yet remains to be done in this respect, even in the present improved form of the weapon.

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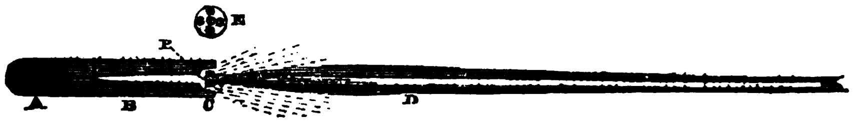
[a] Directions for making and using rockets may be found in the following old works: *Robert Anderson on the making of rockets*; *Biringucci Vanuccio De la pirotechnia*, 1540; *Bate, John, Mysteries of Nature and Art*, 1654; *J. Hanzelet, Traités Militaires*, 1598. In this book is represented a method of employing the rocket in war, thus anticipating in Europe Congreve in the employment of this arm.—*Nye, Nath., Treatise on Fireworks.*

Having already given the reader a diagram of the common sky rocket, we may simply observe that the first war rockets were precisely similar, only their cases were of iron instead of paper, and instead of being headed with ornamental stars, they had appended to them balls, shells, carcasses, &c., according to the use for which they were intended. The construction of the war rocket, as at present modified, will be rendered intelligible by the subjoined diagram*.



The part A indicates the piece of iron attached to the end of the rocket, and serving as a shot—it might have been a shell, a carcass, &c. B corresponds with the body of the rocket, filled with composition, and perforated as in a common rocket; the base of this conical opening expands, it will be observed, into a chamber, P, which is absolutely necessary in order to prevent the rocket bursting; although this necessity adds greatly to the mechanical difficulties which must be encountered, inasmuch as the piece next to be spoken of must be appended to the rocket, after the operation of filling. C represents a sectional view of a piece of gun-metal, a front view of which is shown by E. In this piece consists the great peculiarity of the Congreve or war rocket, enabling the stick, or rather the iron with which it is shod, to be screwed into the central opening, whilst the smaller peripheral orifices communicating with the hollow cone, of which the section of two only are seen in the diagram of the rocket, serve as vents to the flame, and correspond with the one central opening in the common sky rocket.

Such is an outline of this terrible weapon, once peculiar to ourselves amongst European nations, but now employed almost universally. Of course, the details of their construction are very properly kept secret, therefore we can give no more than a general description of their manufacture; they are not, however, difficult to prepare, as we have convinced ourselves by trial, although it is difficult to make two which exactly correspond in every particular. It is imagined by some that the proportion of the ingredients is a great secret; it is a fallacy, however, to suppose any such thing: knowing the object desired to be gained, the composition naturally suggests itself. Now, the object is to compound of three ingredients—nitre, sulphur, and charcoal—a mixture of the greatest power short of bursting the case: chemical science, and a few trials soon lead to the desired end.

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* The stick is represented somewhat short, for the sake of convenience. The actual length of the 6-lb. rocket stick is *seven feet*, of the 12-lb. rocket stick, *nine feet*.

The manufacture of rockets as military weapons, must always remain, notwithstanding its simplicity in theory, a matter in practice of very considerable difficulty. When we consider that the expansion and contraction of the iron cases render the composition liable to crack; when we reflect on the difficulty of preventing contact between the iron and the composition for any long period[a], and of thus guarding against oxidation; or the difficulty in making every rocket of the same size, and to contain its due weight of composition; of ramming them equally hard; and of supplying them with sticks correctly planed,—these difficulties would almost bring one to the conclusion that rockets must remain mere elegant pyrotechnical devices; or if used in warfare, not to be reckoned amongst the appliances of the well trained and precise artillery of Europe. The superior dexterity of our artisans, however, has in great measure overcome these difficulties, and the rocket, although confessedly an erratic missile, is, when not pressed beyond its proper sphere, a most efficient and terrible weapon.

Like most inventors, Sir William Congreve imagined that his war rocket would completely alter the practice of artillery, and would be all but universally applicable, whether for the purpose of battering fortifications or slaughtering men. He advocated the plan of furnishing rockets to every part of the army—cavalry, infantry, and artillery—and was opposed to the scheme of organizing an independent body of troops, like the present rocket troop, for the employment of this weapon. The peculiar advantages of the rocket, as pointed out by Congreve, are 1, magnitude unlimited; 2. portability; 3, freedom from recoil; 4, rapidity of discharge; 5, devastating and terrifying effects of fire in addition to its propulsive force.

Several circumstances conspire to restrain the size of common ordnance within certain limits: there is a difficulty in casting large guns; when cast, there is a difficulty in transporting them; and their missiles, be they balls or shells, are so unwieldy as materially to interfere with their ready use[a]. According to the testimony of Congreve, however, it is difficult to imagine the limit to the practicable magnitude of a rocket. The largest used in our service, we believe, weigh no less than *three hundred pounds!* and are about ten feet high; their extremity being furnished with either a shell or a carcass. Congreve did not think it would be difficult to construct rockets of a much larger size than this; but we are not aware whether he ever carried his idea into practice.

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[a] We believe the interior of a war rocket case is lined with paper glued to the iron, to prevent the composition touching the metal, and thus rusting it; a result which would entirely spoil the missile.

In field operations the rockets most usually employed are much smaller than the variety which we have been speaking of, the usual sizes being six, twelve, and eighteen pounders.

The rocket, urged as it is by its own impulse, and therefore requiring no ordnance to project it, has the advantage of great portability. Even a cannon no larger than necessary to project a six-pound ball, weighs several hundred pounds, and, therefore, is found difficult to be transported into mountainous regions. Six-pound rockets, however,—indeed rockets of much heavier weight—may be transported everywhere. If then the flight of rockets could be rendered as accurate as the flight of shot, the trouble and expense of conveying cannon to mountainous regions might be dispensed with.

The next great advantage of the rocket to be spoken of, is its freedom from recoil, which frequently becomes a serious impediment to the employment of common artillery. In most engagements, whether by land or sea, so great is the obscurity occasioned by smoke, that after the cannon have been pointed and discharged, the second round is fired more or less at random—their recoil having disturbed the original aim, and the object being no longer visible. Now a rocket has no recoil, therefore all circumstances being the same, a second rocket will follow the path of the first. Great as this advantage may seem at first, in practice it is entitled to very little consideration, on account of the natural irregularity of the flight of these missiles. There is another case, however, in which the absence of recoil in a rocket renders it a most valuable kind of artillery. It was formerly thought impossible to use mortars at sea, on account of the strain which they occasion by their recoil. This difficulty has long been overcome; ships having been made of a peculiar construction, purposely adapted for the service, so strongly built that the shock does not materially affect them until after considerable firing. It would be quite impossible, however, to use mortars in a boat, or even in a vessel not constructed on purpose; an objection which does not apply to the rocket, which, although of the largest size, may be shot without difficulty from boats just large enough to carry them.

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[a] The weight of a 12-pounder gun is 18 cwt., while that of a 12-pounder rocket tube, which projects the *same weight of ammunition*, and *at least* to the same distance, *is only* 20*lbs.!*—*Congreve, op. cit.* p. 37.

Rapidity of discharge, and concentration of fire are other advantages possessed by the rocket—requiring merely to be placed in the intended direction, and ignited. Batteries of several hundred rockets may be planted against the enemy, and fired almost at the same instant by the aid of quick match. The particular methods of firing rockets in volleys will be mentioned presently.

The last specific advantage of the rocket which remains for us to mention, is the devastating effect of its fiery train. Cannon balls and shells rush on their objects unseen, or faintly visible; not so the rocket, which carries with it a long fiery tail, burning every thing in its course, exploding ammunition waggons, mowing down troops, and producing amongst cavalry the most inextricable confusion. No horse, however well disciplined in regard to other artillery, will stand the hissing of a rocket, not even the horses of the rocket brigade.

If the rocket could be endowed with the precision of which cannon are susceptible, it would indeed accomplish all that Congreve hoped; but such precision has not yet been attained, and this for obvious reasons. In the first place, the theoretical determination of a rocket's flight is a much more difficult affair than the determination of the flight of a shot or shell; because in the former case we have a constantly diminishing weight, (occasioned by the burning of the composition,) producing a continued variation of the centre of gravity; whereas in the latter case the weight never varies, and its centre of gravity never shifts. So great is the care, however, with which our rockets are manufactured, that we might be warranted in entertaining the idea that the difficulty just alluded to might be overcome by the results of practice: unfortunately, however, there is a much more serious cause of error in the deflecting agency of currents of air. If such currents are capable of producing a manifest effect on the flight of shot and shells, bodies either homogeneous, or nearly so, how much greater must be this influence on a missile formed like the rocket, which, in addition to its being composed of two separate materials, wood and iron, departs as far as possible from the spherical or most perfect form, in regard to freedom from the interfering causes of atmospheric currents! Congreve considerably diminished the length of stick, and in this he accomplished much; he also endeavoured to dispense with the stick altogether, and attach in place of it a ball of iron; the plan, however, did not succeed, neither have many others, attempted at various subsequent periods, all being referrible to the grand cause, or imperfection in the course of a rocket—its stick. We have called this deviation from the visual course an imperfection, and doubtless it materially diminishes the sphere of applicability of the rocket; if, however, this arm be employed for its true and legitimate purposes, that is to say, against large bodies of troops, or large masses of buildings, or shipping, then this same erratic course becomes a perfection.

There are many cases in which shot and shells can be guarded against, owing to a knowledge of their general accuracy of projection. This cannot be said of the rocket, against which all common precaution is in vain; once amongst a body of troops, once its original course departed from, no one can tell whither it will go. It may seem to fly to the right, the troops give way to let it pass, and thicken on either side; on a sudden the missile encounters some impediment,—a stone, a little mound, a dead soldier,—and forthwith its course is changed towards the left; hissing, plunging, darting like a meteor of fire, it rushes into the thickest ranks—what it fails to strike it burns; its force now seems expended—already it has penetrated through a dense mass of living beings,—for an instant it lingers: its fiery elements, now gaining new strength, urge it again forward with a renewed and terrible force! This is, indeed, a fearful peculiarity of the rocket: other projectiles being once impeded in their flight, cannot renew their power; theirs is merely a first impulse—the primary force of gunpowder: not so the rocket, which carries with it its own propelling agent, and thus literally *vires acquirit eundo*.

It now remains for us to describe the apparatus which is employed for the purpose of directing rockets in their proper course. When first they were introduced into the army, Sir William Congreve employed either grooved channels or tubes. The former idea might have originally suggested itself to him, but it is certain he had been anticipated by Hanzelet, who, at page 38 of his *Traités Militaires*, published in 1598, gives a description and diagram of the military use of the rocket[a].

In the present day, when any apparatus is employed, this is invariably of the tubular kind, but not unfrequently rockets are simply laid upon the ground connected by means of quick match, and fired in what is called *the ground volley*. The present improved rocket tube is shown by the annexed diagram, which requires no minute description. It will be seen to be capable of elevation and depression by a contrivance which is obvious; any necessary angle of elevation is taken by means of a graduated slide, which is seen attached to the upper part of the tube.

Sir W. Congreve invented carriages, on each of which was mounted many such tubes. These carriages were intended to run into action like light field guns, yet pouring a discharge of metal from each tube equal to the effect of the gun as regards penetrating force, in addition to the devastating effect of

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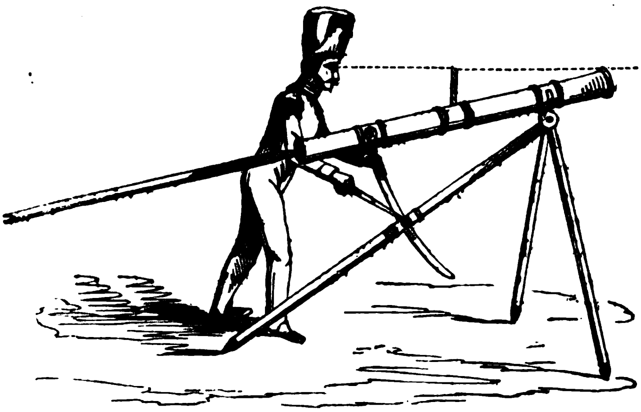
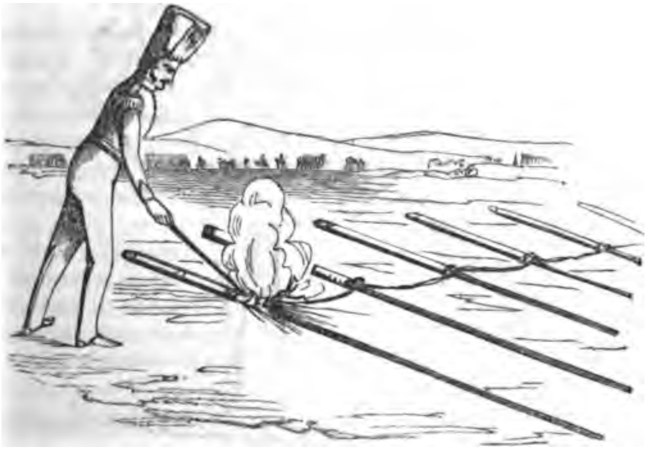
[a] The chapter is thus headed;—*Comme l'on peut tirer droittement une fusee à fleur d'orison ou autrement*. Then follow a description and woodcut. The rocket is directed by means of a groove.



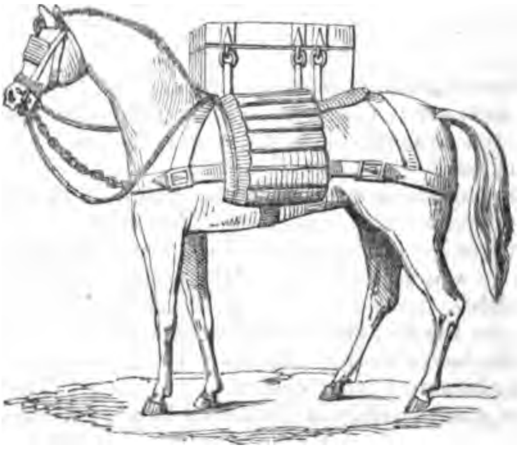
fire. These carriages, however, are now no longer employed; when rockets are required to be fired in great numbers simultaneously, the ground volley, as it is called, is found to answer every purpose.

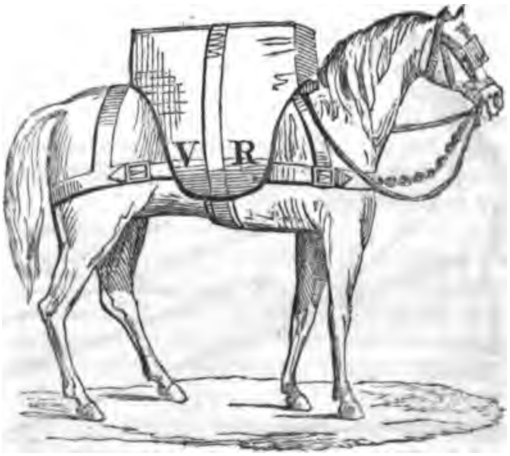
This arrangement consists in laying any number of rockets on the ground at determinate distances from each other, connecting them by a quick match, and firing them in rapid succession, for which purpose only the end of the match requires to be ignited. If the ground be moderately smooth, the rockets proceed, for the first 100 or 150 yards, near the ground surface, afterwards, however, they rise more or less, become deflected, and rush about in a most destructive manner. The manner of firing the ground volley is illustrated by the accompanying diagram.



Sir W. Congreve, as we have already observed, considered that the peculiar genius of the rocket lay in the facility of its general adaptation by all troops; he was averse to the formation of a specific rocket troop, and particularly advocated the employment of the arm by cavalry, which he maintained might thus derive the power and force of artillery without its weight and difficulty of transport.

Annexed is a sketch of his proposed plan of carrying the rockets, which are represented to be arranged on each side of a kind of pack saddle. The sticks in two lengths being carried in a box on the horse's back; when used they were to be joined by a screw.





This scheme of Congreve's has not been thought available; the rockets are now carried in waggons on purpose, and on the waggon is buckled the tube, which when used is removed and fixed on its tripod, as represented by the diagram at page 111.

Each man, however, of the rocket troop rides into action with some rockets already supplied with sticks, and ready to be fired; these he carries in buckets, attached on either side to his stirrup. Of six-pound rockets three are thus carried on either side, after the manner of a lance, and thus they are immediately available before the rocket waggon can be opened.

We shall conclude this account of rockets, by enumerating some of the results which they have brought about on different occasions of their being used.

The first employment of rockets in European warfare was in the attack of Boulogne, October 8, 1806. "In about half an hour," says Congreve[a], "about 200 rockets were discharged; the dismay and astonishment of the enemy were complete—not a shot was returned—and in less than ten minutes after the first discharge, the town was discovered to be on fire." It has never been correctly ascertained how much of the town was consumed on this occasion, the French having given but vague representations of the calamity. The fire, however, could not have been inconsiderable, since it raged from two o'clock in the morning to the next evening; and a further proof to this effect is the caution with which Lord Lauderdale and his suite were guided through the town some few days after the attack, not one of them having been suffered to leave the inn at which they were placed, nor any one permitted to have communication with them; even in passing through the streets, they were conveyed in close cabriolets.

In 1807 rockets were again used with great effect in the attack on Copenhagen. Subsequently to this period a rocket troop was formed at Woolwich, under Captain Bogue. At the memorable battle of Leipsic this rocket troop afforded the first proof of the military utility of their terrific weapons. They were the only English present on the occasion, and on firing a volley against a mass of French infantry, the latter, terrified at the devastation and slaughter effected by the new weapon, at once threw down their arms.

Such are a few of the memorable occasions on which rockets have been employed in actual warfare. Did our limits permit us to trace the progress of our arms in India, we might still further illustrate their tried efficacy. Enough has been said, however, to demonstrate their advantages and disadvantages; those who require further description of this weapon, and its application, we must refer to Congreve's interesting book, which we have alluded to more than once.

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[a] A Treatise on the general principles, &c., of the Congreve Rocket system.

ON THE APPLICATION OF GUNPOWDER TO MILITARY MINING.

Our remarks on this subject will be very few, inasmuch as the mere principles of mining operations, so far as relates to the operation of gunpowder, are simple enough, although the application of these principles to practice demands a great amount of mechanical, mathematical, and chemical skill. Modern engineers, particularly the French, have devoted especial attention to this subject, and have calculated the effects of gunpowder at various depths and in various soils, with great accuracy. In England, the gunpowder for mining operations does not differ in composition from powders used for other services; its immediate force or rapidity of fire, however, might be diminished with much advantage. We have already observed, page 29, that a powder may ignite so rapidly that its power as a propulsive agent is materially injured, because a certain amount of continuity of action is desirable; the remark applies still more forcibly to the case now under consideration, and hence the fact, so well known to our mining communities, that damp powder is more efficacious in blasting rocks than dry powder.

It is not our province to detail the operations of military mining probably the only interesting part of the subject to general readers is the plan of communicating the fire to the magazine. This was effected by means of gigantic quick matches or leaders, made of long canvass bags, containing powder; now, however, military science has availed itself of the voltaic battery for this purpose. The use of this instrument is attended with many advantages where it can be employed. The magazine, no matter how far situate from the operator, is fired instantaneously; the communicating agents being merely wires, are more easily laid down than the canvass hose employed in the old operation. These are two great advantages, and the voltaic battery is by no means difficult to manage. It may not be unnecessary to state by what means the voltaic influence is applied to this purpose; the explanation is simply this: if the electric circle be completed by a conductor of metal sufficiently small, the latter becomes hot: provided its size be sufficiently diminutive, it becomes red or white hot;—particularly if the metallic communication be effected by platinum, which is a very bad conductor of heat, and therefore rapidly assumes a very elevated temperature. Supposing then it is desired to fire a magazine by voltaism, all that is necessary is to transfix a cartridge with a piece of platinum wire, each end of which is joined to a larger wire of copper, and the latter, on either side, is placed ready to communicate with the poles, or, as they are now called, the *anode* and *cathode* of a voltaic battery. This communication may be effected in an instant at word of command, when immediately the platinum wire becomes red hot, and the cartridge and whole magazine explodes, blowing a large crater out of the earth, and hurling into destruction such works or troops as may be on the surface.

The application of voltaic electricity has, perhaps, been of still greater use in exploding subaqueous magazines, operations which, before its introduction, were accomplished by far more inconvenient methods.

THE HISTORY AND EMPLOYMENT OF SMALL FIRE ARMS.

Long after cannon, mortars, and other ordnance of fire had supplanted the more ancient balista, catapult, battering ram, and other mechanical engines of war, the long-bow, arbalest and sling, maintained their undisputed sway. The reason of this is not difficult to assign; the construction of small arms, to be more effective than our own national weapon, *the long bow*, or the arbalest of continental Europe, was a matter of no small difficulty. The mechanical ordnance of ancient times was either ineffective, or its power was achieved at the expense of vast mechanical skill, and expenditure of material; its transport was always extremely difficult, even for the purpose of siege, or garrison service; in the field, this difficulty rendered its employment almost unknown. Our ancestors, however, were much better supplied with small missiles: we have already spoken at some length of the force of the bow; we have individualized instances of its power and convenience,—we have seen that it was in the powerful hands of our old archers a most prompt and effective missile; the reader will still better learn to appreciate its valuable qualities, when he shall have directed his notice to the imperfect small fire arms of our fathers. In proportion as the manufacture of small fire arms improved, the advantages derivable from this kind of missile could not fail to be in some degree appreciated. Prejudice, nevertheless, amongst other causes, strongly operated against the general application of small fire arms. Indeed the prejudice against even *cannon* was at first very strong: the iron clad knights had long managed to guard their own bodies against mechanical missiles; a good suit of armour would generally repel the blow of an arrow, and the horses less fortunate, having grown mad with rage and pain from the thrusts of barbed missiles, and thrown their riders, the doughty warriors would roll on the earth awhile, and then retire with a few insignificant bruises—to engage in this innocent tilting another day[*]. The introduction of cannon was a sad blow to their chivalry: loudly did they protest against the villainous saltpetre; loudly they inveighed against such unknightly modes of fight; the force of public opinion was, however, too strong for their prejudices—the opinion had become prevalent that warfare, consistently with its true genius, could not be rendered a gentle pursuit. Then many of those belted knights, finding that warfare had become so ungentle a pursuit, quietly seceded from the ranks, and betook themselves to arts more worthy of their blood; others grew accustomed to the cannon, and risked their chance of death. But when the ungentle musket began to supplant the bow, what a terrible innovation was there:—deep and loud were the execrations of the knights; low the mutterings of the armourers, who began in near prospective to see their occupation gone. For a period the strength of armour was increased: breast-plates acquired the thickness of anvils; helmets became like iron cooking pots; horses tottered under their heavy loads—knights were not infrequently smothered in the fray! It was useless any longer to affect disgust at innovations; the day of chivalry had passed; knights felt they were no longer the strength of an army, nor did their armour secure them any immunity from injury and death. Gradually, then, manual weapons of fire were universally employed; the soldier threw away his armour, the knight relinquished his lance; rapid evolutions succeeded to the slow but ponderous charge, and the whole system of war changed.

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[*] In several battles about this time not a single knight was slain: when unhorsed it was difficult to penetrate the joints of their armour by the *misericorde* or dagger, and at the battle of Fournoue under Charles VIII., a number of Italian knights having been unhorsed, could only be killed after they had been broken up like so many lobsters with woodcutters' axes! This circumstance justifies the remark of James I., that defensive armour was a double protection,—preventing the bearer at the same time from being injured, and from injuring others.

[To be concluded.]

NOTES ON NEW BOOKS.

UNDER this head we propose, from time to time, to give something like a record of the progress of publication, such a record as, without entering into detailed criticism upon individual works, will serve to give the reader a general idea of the most prominent features in the literature of the day.

It so happens that we commence our labours in this department under promising auspices, several works of importance and interest in the several walks of literature having been produced in the course of the past month. To begin with, perhaps, the most important,—Mrs. Austin's Translation of "Ranke's History of the Reformation." To those who are aware of the sterling character of this writer's former work, "The History of the Popes, during the sixteenth and seventeenth centuries," the present volumes will need no stronger recommendation, than that they form a worthy companion to that important work. The same laborious search after facts, the same patient investigation of evidence, the same calmness of tone, which characterized the one, are found in the other; and we need hardly add, that upon such a subject as these volumes treat of, these qualifications are as invaluable as they are rare. The author states, in his preface, that his object has been, besides recording the history of the Reformation as a religious movement, to give a picture of the political proceedings of the nations of Europe, particularly the German states, as affected by or bearing on that movement. "From the first ten years of the fifteenth century, to the beginning of the thirty years' war," he says, "the constitution and political condition of Germany were determined by the periodical diets, and the measures resolved there." They made peace and war, levied taxes, and had all the powers of sovereignty. Yet the history of this important dynasty, if we may so apply the term, has never been adequately attended to. The record of the proceedings has sunk into comparative oblivion, from which it became the ambition of Leopold Ranke, as the great labour which should signalize his life, to rescue them. In 1838, he was so fortunate as to stumble upon a collection of "these precious documents," the acts of the Diet, from 1414 to 1613, consisting of ninety-six folio volumes; and with eager avidity he devours, or makes himself "master of the contents of the first sixty-four," extending down to the year 1551! But even this was not enough. The archives of a single town, though they mustered ninety-six folio volumes, were but as a single meal to the insatiable German. He obtains permission to explore all the archives of Prussia at Berlin, and those of Saxony at Dresden and at Weimar. The latter, he says, are so voluminous, that the "walls and whole interior space of the vault, where they are preserved, are covered with the rolls of documents relating to the deeds and events of the period." We merely state these facts to evidence the zeal and industry with which this German author sets about his work, and as an example worthy of imitation by historical writers in other countries. The present issue of this work consists of the first two volumes, bringing the history down to the year 1528. The complete work consists of five volumes. The translation, by Mrs. Austin, is admirably done.

The third and fourth volumes of the "Diaries and Correspondence of the Earl of Malmesbury" complete the records of court proceedings by that distinguished diplomatist, bringing them down to the close of the last century. The most interesting subject embraced in the present volumes, is the unfortunate marriage of Caroline of Brunswick with George the Fourth. Lord Malmesbury was the agent deputed to demand the hand of her Royal Highness, and to conduct her to England. His notes at the time, of her character, appearance, and bearing, which were any thing but dignified or prepossessing, are but too prophetic of the misery which is to ensue. His lordship's impressions of her appear to amount to this:—that she was tractable, and anxious to please; that she possessed quickness, but no judgment; apt to be caught by the first impression, led by the first impulse, and loved talking, confiding, and making *missish* friendships. Besides this, she was not very cleanly in her person or dress; her under-garments, made of coarse materials, and not changed often enough; of which, with other matters, his lordship had to admonish her, either directly or through her women! The princess's reception by her future consort is too striking an incident not to be repeated here:—

"I immediately notified the arrival to the King and Prince of Wales; the last came immediately. I, according to the established etiquette, introduced (no one else being in the room) the Princess Caroline to him. She very properly, in consequence of my saying to her it was the right mode of proceeding, attempted to kneel to him. He raised her (gracefully enough), and embraced her, said barely one word, turned round, retired to a distant part of the apartment, and calling me to him, said, 'Harris, I am not well; pray get me a glass of brandy.' I said, 'Sir, had you not better have a glass of water?'—upon which he, much out of humour, said, with an oath, '*No;* I will go directly to the queen,' and away he went. The Princess, left during this short moment alone, was in a state of astonishment; and, on my joining her, said, 'Mon Dieu! est ce que le Prince est toujours comme cela? Je le trouve tres gros, et nullement aussi beau que son portrait.' I said his Royal Highness was naturally a good deal affected and flurried at this first interview, but she would certainly find him different at dinner. She was disposed to farther criticisms on this occasion, which would have embarrassed me very much to answer, if luckily the king had not ordered me to attend him."

Horace Walpole's "Memoirs of the Reign of George the Third," edited by Sir Denis Le Marchant, are an important addition to the history of the period to which they refer, namely, the first ten or a dozen years of the reign mentioned. They throw light upon many points, particularly of character and motives, which we did not possess before.

Sergeant Talfourd has published a pleasant account of his "Vacation Rambles and Thoughts," his recollections of three distinct tours in the vacations of 1841–3. The field is, of course, (the Rhine, Switzerland, and Italy,) well trodden enough already to be sure, but the worthy Sergeant's narrative has a recommendation over those of many who have travelled and written there before him, in its total freedom in style from that of the "professional tourist." The work is remarkable also by a double dedication; "duplicity" being fatal in affairs of pleading, but not, we suppose, (according to the learned sergeant,) in matters of friendship. He first dedicates his work to R. V. Richards, Esq., Queen's Counsel, in an address of some pages, and then to his wife, in the following honest, warm-hearted language:—"To her whose image endears the recollections of a delightful tour, as it cheers and graces the journey of life, these 'trivial fond records' are inscribed by a grateful and admiring husband." Bravo, Sergeant! Three cheers to you—as lawyer, poet, and good fellow!

"The Letters of a German Countess," by Ida, Countess of Hahn-Hahn, are full of just that description of gossip about things grave and gay, important and trifling, which in women of spirit are so happy. She writes during travels which extend over Turkey, Egypt, the Holy Land, Syria, Nubia, &c., and is particularly descriptive in all that relates to the state of society in those various parts. The work is clever, and is worth skimming over.

No less than three novels have been produced during the past month; two of them, namely, "Rodenhurst," and "Valentine M'Clutchy," being more or less political novels; the other, "Lady Cecilia Farrencourt," being of the good old style of novels, presenting nothing very remarkable, except an annoying misquotation in its motto, namely,

"She is a woman thereof to be wooed,
She is a woman thereof to be won."

To which is appended the word "Shakspeare," whereas Shakspeare never wrote any such nonsense.

To go backwards with the other two. "Valentine M'Clutchy, or the Irish Agent," by W. Carleton, is, as the title implies, an attempt to illustrate the woes of Ireland from Absenteeism, Orangeism, and so forth, in the form of a fiction. The Church and Repeal questions, of course, come in for their share. The author, in his preface, tells us that his book is an entirely new one, presenting phases of Irish life which have never been given before. He adds, that he was born in one of the most Orange counties, namely, Tyrone; that he is a liberal Conservative, "I trust, a rational one; but I am not, nor ever was, an Orangeman." Whether the author be "rational" or not, according to Irish parlance, we will not pretend to say; but certainly the tone of his book exhibits very little moderation, very little discretion, and we apprehend, from its exaggerated tone, can hope to produce very little impression. It is a one-sided view of things, vilifying all landowners and agents in a lump, as rogues and fools, and making out the tenantry to be the most discreet and amiable people on the face of the earth

It is a new thing also, and one of which we cannot approve, to introduce polemical controversies into novels, particularly such an unseemly squabble as takes place between two convicts, Darby and Bob, the one a Catholic, the other a Protestant, and in which the tenets and sacraments of the two persuasions are ridiculed in the most offensive language. We repeat, we are sorry to see such a work published, and we are very sure it will not meet with encouragement from the better class of readers.

"Rodenhurst" is written in quite a different spirit and vein. Its policy is Church and State, and the good old style of things, before heresy and wooden shoes came over with William the Dutchman. The divine right of kings, the infallibility of the Church, the abomination of dissent, and the prescriptive and inalienable privileges and authority of the old cavalier class of society; the mutual duties and claims between the latter and their peasantry, are all taken up in a bold and uncompromising tone, and handled with ability in a story of considerable interest. We have nothing to do with the author's politics; but his powers of invention and romance-writing are considerable.

PAINTING AND DESIGN.

Lectures on Painting and Design. By B. R. Haydon, Historical Painter. Longman and Co.

The general and increasing interest which the public are now taking in the fine arts, is one of the most remarkable and gratifying signs of the present times. It is a decided movement in advance of our whole mental fabric, at once the result and means of moral improvement. As yet, however, this movement has been a very uncertain one, carried on without either organization or purpose; and much remains to be done before any thing of this sort can be accomplished. Men are too apt to look at pictures for the mere purpose of gratifying the eye, not to inform the sense, or awaken the sympathies; they overlook the fact that the art of painting is only another sort of language, and that being the noblest and most abstract of languages, its legitimate use is with dignified and idealized subjects. To grasp such themes, however, and to appreciate the ability with which the artist has treated them, requires a cultivated taste on the part of the beholder. For want of this amongst our ordinary mob of exhibition hunters, how many do we see crowding round a fruit or "still-life" piece, or some elaborate portrait of a boy eating a hot potato, for one that stands to gaze in wonder before Del Piombo's Lazarus, the finest picture in England,—one of the few finest in the world! The reason is obvious,—they cannot understand the one—the others have nothing in them to understand. And this remark applies not only to the humbler classes of society, but to a sad extent also to those who have pretensions to be considered men of taste and virtu. Hence the prevailing fashion for the exquisitely finished gems of the Dutch and Flemish schools, in which, with strained and wondering eye, we examine through a magnifying glass the inimitable finish of a glass decanter, a copper pan, or a patched elbow, whilst the nobler poetical subjects of the Italian schools, with some few exceptions, are left in comparative neglect.

Whilst such is the superficial taste on the part of the public, it cannot be wondered at that our artists should emulate to captivate it, postponing all attempts to reach the higher walks of art, where they would find themselves without admirers or patrons. It is not to be wondered at, either, that in this struggle to catch the eye, our artists should have little or no uniformity, much less any community of principles, and that they resort perpetually to new inventions and devices for their effects, instead of the ascertained experience of their predecessors. Rules would only be impediments to genius so disporting itself: and whilst things remain as they are, all idea of a School of Art, such as existed in Florence, in Rome, in Lombardy, in Venice, in the palmy days of revived art, must be abandoned.

In effect, it is now upwards of half a century since Sir Joshua Reynolds delivered his last lecture to the students of the Royal Academy, concluding, as every body knows, with this emphatic tribute to the great master genius of modern times: "I should desire that the last words which I should pronounce in the academy, and from this place, might be the name of MICHAEL ANGELO!" The wish was fulfilled; they were the last words he ever uttered in the Academy, and he died little more than a twelvemonth afterwards. The name of Michael Angelo is still in every pretender's mouth; but how little is the real character of his genius, and his real merit, understood by those even who have presumed to adopt his "style." In like manner, the lectures of the worthy president are still read with delight and admiration, still recognized as "canons of taste;" but how little even are they appreciated in their full scope and intention, and how little has been done since to fill up the outline,—for they are, after all, but an outline,—of the elementary principles which they comprise; how rare the instances of patient adherence to his advice, as to the course of study which he recommended. And how discouraging and mortifying is it to find men, who can supply little of their own, throwing doubt and discredit upon the labours of their predecessors. And this brings us to the consideration of Mr. Haydon's volume.

Reynolds, throughout his discourses,—whilst he animated the zeal of the ambitious, and encouraged the timid to attempt and to hope; whilst he proudly proclaimed the heaven-born nature of genius, took care to warn his hearers, that genius without industry and schooling would not achieve its purpose;—and that even mediocrity, by means of industrious study and persevering practice, might attain to a respectable and useful position, if not to eminence. "There is one precept," says Reynolds, in his second discourse, "in which I shall only be opposed by the vain, the ignorant, and the idle. You must have no dependence on your own genius. If you have great talents, industry will improve them; if you have but moderate abilities, industry will supply their deficiency. Nothing is denied to well-directed labour; nothing is to be obtained without it. Not to enter into metaphysical discussions on the nature or essence of genius, I will venture to assert, that assiduity unabated by difficulty, and a disposition eagerly directed to the object of its pursuit, will produce effects similar to those which some call the result of *natural powers*."

We have quoted this passage at length, because Mr. Haydon (who lectures in 1835, before the Mechanics' Institution of London,—just half a century after his great predecessor quitted the academy)—because, we say, Mr. Haydon opens his course of instruction with a violent attack upon Reynolds, and quotes scattered portions of this passage for the purpose of turning it into ridicule. Mr. Haydon denounces the modest principle inculcated by Reynolds, and points proudly to his own position and career as an instance of genius,—self-relying, self-tutored, and self-appreciated,—arriving at the highest eminence.

Accordingly, he tells us how, as one of his earliest steps in the pursuit of the fine arts, he cut up a lion, and hung it up by the neck, in order to compare it with the human figure. "Many years ago," he says, "while dissecting a lion, in my early youth, I was amazingly impressed with its similarity—as well as its difference, in muscular and bone construction to the human figure. It was evident *the lion was but a modification of the human being* (!)—varied in organic construction and muscular arrangement only where it was necessary he should be, that his bodily powers might suit his instinct, his propensities, his appetites, and his lower degree of reasoning power." And then, he proceeds to "discover" and theorize upon points in natural history which have long been familiar to all who have condescended to study the works of those who have written on the subject of comparative anatomy. In the same way,—after inculcating the necessity of dissection, as the only means of acquiring accuracy in drawing, (indeed, he goes almost to the length of saying, that a man who thoroughly understands cutting up a body must be able to draw one, whence of course a surgeon ought to be a fine artist,)—Mr. Haydon proceeds to give as the result of his "discoveries," an account of the bones and muscles of the human body, which, if it adds little to the store of knowledge already existing on the subject, confuses much. We envy the complacency with which the author, speaking of his labours, says, in his preface:—"*It is here supposed that every reader is ignorant of the subject*," (this is necessary to an appreciation of Mr. Haydon,) "he is taken by the hand, he begins at the beginning, he goes through step by step; and if he will studiously read every lecture, and *not go to another till he knows and comprehends the preceding one*, and put in practice what he learns, *I promise faithfully to bring him to that delightful reward of all his anxieties at last,—a hand and eye obedient to his conception.*"

Mr. Haydon, whilst he arrogates to himself the privilege of instructing others, is jealous of any one else who pretends to impose rules or inculcate principles to genius. Sir Joshua Reynolds is an especial object of his attack; but indeed every body else, who has pretended to impose the shackles of the schools upon native free-born genius, to enunciate principles of taste, or to point out methods of study or examples for imitation, comes in for an equal share of rebuke. On the other hand, whilst our enterprising lecturer destroys all that has been established before him, he is rather sparing and desultory in the lights and aids which he affords us in their stead. For instance, Reynolds, as we have seen, recommended Michael Angelo to the young student as his model in the grand style; Haydon, on the contrary, "respectfully differs from Reynolds in his incautious recommendation, without qualification[*], of Michael Angelo. So far," he adds, "from getting casts of his sculpture, *banish all traces of his pedantic twistings!*" Again, in the matter of composition, as regards the distances between the groups of figures, colours, &c.; "an able professor thinks this may be brought to calculation by and by." Again Haydon "respectfully differs: the only regulation is, *that one group should be within gun-shot of another!*" This is giving genius "a latitude" with a vengeance!

One of the few affirmative principles which Mr. Haydon lays down, he enunciates very emphatically; it is this:—"Let your colour be exquisite, let your light and shadow be perfect, let your expressions be touching, let your forms be heroic, let your lines be *the very thing*, and your subject be full of action,—you will miss the sympathy of the world, you will interest little the hearts of mankind, *if you do not lay it down as an irrefutable law, that* NO COMPOSITION CAN BE COMPLETE, *or ever will be interesting, or deserve to be praised, that has not a beautiful woman, except in a series.*" Now that a beautiful woman is a very pleasing object, in or out of a picture, no one can deny; but that there are many historical subjects, and some of the very grandest, in which the introduction of a beautiful woman would be historically impossible, must be obvious. Indeed Mr. Haydon himself must be aware of a case in point, in a masterly picture by an eminent "historical painter" of the present age, representing the late Emperor Napoleon, wrapped in a green coat, and in a brown study, contemplating "the open sea" from the top of the desert rock of St. Helena. But if we doubted for an instant as to the force and propriety of the principle laid down by our lecturer, as to the necessity for the introduction of a female for the completion of a picture, the very directions which he gives, for the manner of her introduction and the effect she is intended to produce, would confirm us in rejecting the principle altogether. "Another cunning and touching secret of Raffaelle's and Correggio's power over us," he says, "was, that in every face of a beautiful woman they painted they gave a tender air of sympathy and love. So that in most of Correggio's and Raffaelle's women, if you clear all the figures away but the woman, you may, *without the least alteration of look whatever, put a lover declaring his passion on his knee, and you will find the expression of the woman's face suit exactly.*" A gross idea and a false idea, (we need not form the inevitable compound of the two epithets,) which Raffaelle and Correggio would indignantly deny if they were living, and which their living works abundantly and triumphantly refute; see the "Charity" and the innumerable Madonnas of the former, the perfection of chaste, heavenly beauty, and the Madonnas, and above all, the Magdalen of the latter, the almost forbidding beauty and melancholy of which last have never been surpassed. We say nothing of the compliment implied to the ladies by Mr. Haydon's remarks, which amounts only to this, that they are incapable of expression, save that of vanity and selfishness.

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[*] Reynolds did *not* recommend "without qualification;"—for instance, *inter alia*, he says, "that Michael Angelo was capricious in his inventions, cannot be denied; and this may make some circumspection necessary in studying his works; for though they appear to become him, an imitation of them is always dangerous, and will prove sometimes ridiculous;" and then he goes on to enlarge in illustration of this fact. And in various places he admits Michael Angelo's deficiencies in the graces of style, so evident in Raffaelle and Titian.

Of the calm logical tone which pervades these lectures, we have again an amusing specimen in the passage subjoined. It is another argument in favour of genius "depending upon itself," and disdaining to learn in the accustomed schools.

"Go to Italy, say all. Why? Did Phidias or Zeuxis, Euphranor or Praxiteles, leave Greece? Did Michael Angelo, or Raffaelle, or Titian, or Correggio, leave Italy? Go to Italy! *We have the Cartoons and Elgin Marbles*, higher and purer standards than Italy can show. I say, stay at home. *In Italy, every thing has been done;* in England, every thing is to do. Stay in Britain, all ye who glory in the enterprize; stay in Britain, and make her greater than Italy!"

Surely more wild incongruous nonsense was never penned than this. If we got the Elgin Marbles and the Cartoons from Greece and Italy,—if we have got no other great models from any other part of the world,—does it not stand to reason, that we have obtained, but have still to perfect, our skill in arts in the sunny South? If "Italy has done everything," should we not go and see how she accomplished it? Phidias, Zeuxis, &c., did not leave Greece, nor Michael Angelo, nor Raffaelle, Italy;—but why? because they were already in the school of art. But Titian, the Venetian, with all his native powers, did not disdain to improve himself upon the example of Giorgione, who had studied in the old Italian school; and in later times, the Poussins, and the unrivalled Claude, to say nothing of more modern names, did "go to Italy," and to some purpose too! It will, perhaps, be fruitless to devote more time and space to the exposure of ignorance and assumption, such as characterize the precious volume before us. Two more instances, however, we must give, as they are part and parcel of the perpetual attack which the complacent author urges upon the respectable authority to whom we referred at the outset of this article.

Mr. Haydon is contending, in opposition to Reynolds, that the ancient Greeks were as accomplished and preeminent in the art of painting as in that of sculpture. "We find," he says, "at the sacking of Constantinople, that the Greek artists who fled to Italy *carried their grace and practice with them, and actually rekindled art all over the world*; and then about 2280 years after Apelles and Zeuxis lived, *comes an English portrait painter*, as a painter of "high art" grossly deficient, conjecturing they could not be great in extensive compositions, because the painted walls of private houses in a provincial city of Rome gave no evidence of such excellence, though *executed* 500 *years after the greater eras of Greek perfection: it is more than absurd, it is not to be read with patience.*

We are almost tempted to repeat the last italicized words, as our sole comment on this passage; but we must still wage on the war that we have begun with dullness. We will not enter into pleasant and instructive inquiry with Mr. Haydon as to what were the extent and resources of the art of painting as practised by the ancient Greeks. Our business is with doings nearer our own time, in regard to which our author seems to be decidedly under very erroneous impressions. He informs us, that on the sacking of Constantinople, (which occurred in the middle of the thirteenth century,) "the Greek artists fled to Italy, carrying their grace and practice with them," &c. Where has he evidence of this? Where has he ground to contradict the generally received statement, a statement confirmed by all the evidence which the few existing memorials afford, that Greece had experienced her full share of the depressing darkening influence of the middle ages, and that long before they were driven from their ancient homes, her artists had dwindled down into mere conventional imitators, their works presenting little more of originality of invention or composition than a Chinese toy? Does Mr. Haydon mean to assert, that the revival of art, which commenced at Florence in the thirteenth century, was the result of "the grace and practice" brought over with them by the emigrant Greeks? True, they got employment as artificers to decorate churches in various parts of Italy, and had their pupils also in this useful calling; but is it pretended, that Cimabue, or Giotto, or the whole glorious line of creative minds of that period, closing with Michael Angelo and Raffaelle, derived any of their inspiration from their rude and dry productions? As we said before, the testimony of all the examples preserved to us, and the authority of recorded facts, is directly against the supposition. The fact is, the Greeks brought over with them but the lifeless remains, the mere implements and materials of their departed art. It required the vigorous soil of new unexhausted minds to revive them into effective existence, and these Italy spontaneously afforded.

The other and sole remaining point which we shall notice in this production, is the attempt to ridicule Reynolds's (or rather not Reynolds's, but the universally received) notions regarding "ideal beauty." In attempting this, Mr. Haydon finds it necessary, even for his own satisfaction, to say nothing of that of his hearers, to mangle and misquote his subject, instead of giving the passage in full. This passage, which Mr. Haydon so misquotes, in disjointed passages, we here repeat at length; distinguishing within brackets so much of it as this candid gentleman has *not* thought it convenient to quote.

"All objects which are exhibited to our view by nature, upon close examination, will be found to have their blemishes and defects. The most beautiful forms have something about them like weakness, minuteness, or imperfection. But it is not every eye that perceives these blemishes. It must be an eye long used to the contemplation and comparison of these forms; and which by a long habit of observing what any set of objects of the same kind have in common, has acquired the power of discerning what each wants in particular. This long laborious comparison should be the first study of the painter who aims at the grandest style. By this means he acquires a just idea of beautiful forms;—[*he corrects nature by herself, her imperfect state by her more perfect. His eye being enabled to distinguish the accidental deficiencies, excrescences, and deformities of things, from their general figures*, he makes out an abstract idea of their forms more perfect than any original; and, what may seem a paradox, he learns to design naturally, by drawing his figures unlike any one object. His idea of the perfect state of nature, which the artist calls the ideal beauty, is the great leading principle by which works of genius are conducted. By this, Phidias acquired his fame. He wrought upon a sober principle which has so much excited the enthusiasm of the world; and by this method, you, who have courage to tread the same path, may acquire equal reputation."]

This is the complete idea from Reynolds. Haydon only gives half the idea—namely, down to the brackets; and upon *that* hinges the following sarcastic rebuke:—

"Now let us try this system. *Suppose we take a hundred men from the crowd in the streets;* suppose we find, as we should in England, that all the hip muscles were compressed, and only two had the full swelling of the hip, (obliquus descendens,) would it be a sound principle to lay down, that the hip muscle ought to be flat, because ninety-eight of the hundred had it flat, and *because* this *was the greatest number which a given number had in common?*—(Mr. Haydon is not very happy in grammatical construction)—*and that the two were defective, because they were in the one hundred the particular? Surely not.*"

And "surely not," say we; and so does Reynolds too,—as Mr. Haydon will find, if he will take the trouble to read the observations within brackets, which he has ingeniously excluded from his quotation, particularly the words in italics. We need hardly ask how Mr. Haydon or any artist must be situated, who, disregarding the experience and examples of preceding authorities, disbelieving in the principle of the "ideal," should, "making the knife accompany the pencil," as his sole guide, endeavour to dissect his way to the beautiful in form, having, as he must have, at his disposal only the diseased specimens of a metropolitan population, with "accidental deficiencies, excrescences, and deformities," such as he has instanced. To repeat his own words, the result must be "more than absurd."

One word at parting to a brother critic. The writer of an article in the last Quarterly Review on "Italian Art in the Fourteenth Century," could surely not have done more than glanced at Mr. Haydon's volume, when he said of it that it "speaks with *due and discriminating praise* of Reynolds, Fuseli, and Opie," &c.; and praises generally the author's "vigorous language," (which abounds in the grossest grammatical blunders,) and his "profound and discriminating" judgment. Assuredly, if we ever have the much desiderated "school of art," it should extend its province to that of criticism. O.

LETTERS ON ANIMAL MAGNETISM.

BY THE AUTHOR OF "GERALDINE OF DESMOND."

TO THE EDITOR OF THE POLYTECHNIC REVIEW.

SIR,—The admirable letters of Miss Martineau on Mesmerism, which lately appeared in "*The Athenæum*," have attracted so much public attention, as to direct the consideration of many persons to that subject, who previously either neglected it altogether, or viewed it as a legitimate topic for contempt or ridicule.

It is not extraordinary that the testimony of an author so well known as Miss Martineau, and one whose intellectual endowments have been justly acknowledged by the voice of Europe, should thus exercise a general and decided influence. Those who have the most deeply studied her remarkable writings, may perhaps agree with me in thinking that they exhibit greater powers of reason than of sentiment—that they lean towards the rational rather than towards the romantic—and that the faculties of her mind have a more evident tendency to distinguish realities from appearances, and truth from error, than to employ the imagination, or even to be remotely affected by it.

If this opinion be correct, it will add considerable weight to the testimony Miss Martineau has so fearlessly borne to advance the cause of animal magnetism (or *mesmerism* as it is now more popularly called), and to induce a free inquiry into its principles. For it is sufficiently evident that a logical understanding is less liable to imposition, and more likely to investigate facts, and draw accurate conclusions, than a judgment closer allied to an impassioned and poetic temperament. In Miss Martineau's letter of the 23rd of November, she makes the following remark:—"If a few of the many who are now enjoying the results of mesmeric treatment, would plainly relate exactly what they have felt and seen, putting aside all personal repugnance, and despising all imputations of egotism, &c., there would presently be more temper, and more wisdom in the reception of the subject, by many who have no knowledge upon it." This observation seems to me so just, that I resolve to obey her injunction, in casting away all personal repugnance, while adding my testimony to the collection of mesmeric facts which are already before the public.

The enclosed letter I wrote some time ago at the request of an eminent London physician, who intended to make some observations before the Medico-Botanical Society, on the theory and effects of animal magnetism. Under this determination he requested my opinions on the subject, accompanied by a relation of the facts connected with it, which I had witnessed in various parts of the Continent.

My friend meant to have read my letter, in his capacity of professor, at the learned institution I have mentioned, and of which he is a distinguished member; but through a mistake of mine it arrived too late, and consequently has since lain among my papers almost forgotten, until my remembrance was aroused by his requesting me to allow it to appear in print.

Impressed with the conviction that if the principles of mesmerism be true, it is a public duty to promulgate and support them, and that if false they cannot be too soon refuted and exploded, I send the enclosed to your popular Review, conceiving that a narration of the mesmeric phenomena which I have seen may be interesting at the present moment, when freedom of inquiry, and the publication of its results, are the best modes for the establishment of truth, and the detection of falsehood. I am still further impelled to this proceeding since it gives me an opportunity to make known in this country the opinions of the late Monsieur Felix Bodin upon animal magnetism. His genius, name, and moral character, are too universally known to the intellectual public to require panegyric from my pen.

Actuated by a desire to add his testimony to the mass of evidence offered by other celebrated men upon the altar of mesmerism, I enclose, as a valuable communication, and with a view to its insertion in your pages, a note which he addressed to me upon that subject.

I do this, not from ostentatious motives, but simply with an intention of giving Monsieur Bodin's authority to what *he* deemed an important branch of natural philosophy.

Mesmerism, if based on truth, can never be finally put down. If false, it must bring its own refutation. Let the subject, therefore, be examined by competent authorities; let the investigation be conducted with propriety, candour, and impartiality; the alleged facts scrutinized, recorded, and classified. Then, whether the pretensions of mesmerism be verified or disproved, an important benefit will be conferred upon the cause of science, and the interests of mankind.

I have the honour to be, sir,
Your very obedient servant,
M. G. S. C——.

97, Princes Street, Edinburgh,
Jan. 12th, 1845.

FROM THE SAME TO M. D.

My Dear Sir,—In addressing you on Animal Magnetism, the idea of complying with your repeated and urgent request is the only encouraging one I know; for, in the first place, I feel myself a very incompetent judge of such an abstruse subject, and secondly, from circumstances, I have little time to devote to its consideration.

Hence, my observations may seem hurried, immature, and inconsequent.

It is a difficult matter to distinguish between doctrines which surpass our comprehension, and those which contradict our reason; and where propositions are applicable to *mind*, even more than to *body*, this difficulty is increased, from the often erroneous terms which language, drawn as it is from corporeal and sensible images, presents, when employed in attempting to reveal the mysteries of spiritual phenomena.

Owing to this, we often impute to the latter a series of startling inconsistencies, which more properly belong to the medium through which we have been forced to represent them.

When we also consider the vast disparity between what is finite and what is infinite; the darkness that envelopes our researches into the history of moral science, and the singular fact, that most of our important philosophical discoveries have been made by chance, when all the boasted energies of human intellect had failed to elucidate them, I think we should learn humility, and cautiously abstain from pronouncing, that what, to a certain extent, is incomprehensible, *cannot be true*. "There are more strange things in heaven and earth, than are dreamed of in our philosophy." And the glimpses or modifications of Animal Magnetism which the ancients seem to have had, under the various forms of enchantment, necromancy, and divination, and which, in modern times, have appeared in the guise of false miracles, second sight, and Eastern magic, appear like deductions from principles, which, though but imperfectly understood, support in some degree the reality of the attractive science now revived from *its own long sleep* by the investigation and exertions of philosophic men. Among the latter, I mention with mingled feelings of regret and admiration my late lamented friend, Monsieur Felix Bodin, a member of the Chamber of Deputies, and of many learned institutions, one of the most popular of modern French historians, honoured by the personal esteem of his Majesty Louis Philippe, the literary coadjutor of Monsieur Thiers, in his celebrated work on the French Revolution, and altogether a man of superior talent, high moral character, and great consideration in his own country.

This was fully proved by the unusual share of public attention bestowed on his *brochure* on the abolition of the hereditary peerage in France, which was the first work that attracted the legislature to the consideration of that important subject.

Monsieur Bodin's belief in animal magnetism was *unqualified*; and he has frequently related to me the most extraordinary cures performed by his own manipulations on persons in whose diseases *imagination* could have had no possible share or influence.

I recollect one, in particular, which he assured me he effected on a faithful family servant, who for twelve years had been bedridden from paralysis, and who, at length, having tried all the usual remedies in vain, submitted with much reluctance to his mesmeric agency, which perfectly and permanently restored the sufferer to the use of his limbs, without deriving aid from any other source.

Monsieur Bodin also communicated a still more singular anecdote relating to himself, the truth of which his unquestionable veracity places beyond suspicion. Having been attacked by brain fever, he lay almost at the point of death. Still he had occasionally lucid intervals. In one of those, perceiving his own danger, he insisted on being mesmerised. A practitioner was called in by his medical attendants; but before he arrived, my lamented friend was again in a paroxysm of his frightful malady. This was almost instantly calmed by the passes of animal magnetism, and he soon fell into the mesmeric sleep. While under its influence, he suddenly started upright on his couch of suffering, and imperatively called for pen, ink, and paper, which were immediately procured. To the astonishment of all present, he then, as if under the power of inspiration, rapidly composed and wrote down, though his eyes were sealed in deepest sleep, the exquisite stanzas and music, which, *unaltered*, he afterwards published under the title of "*La Langueur*." Monsieur Bodin has often described to me the emotions of profound astonishment with which, on being demesmerised, he contemplated this touching effusion of his genius; for, being perfectly unconscious of all that had passed during his mesmeric trance, the friends who had witnessed its composition could scarcely persuade him to believe it *his own*, until an examination of his peculiar handwriting confirmed the fact.

I enclose a brief note in reply to my request that, through Monsieur Bodin's introduction, my English physician at Paris might become acquainted with the celebrated magnetiser of that capital, Le Docteur Chapelain. I was then suffering much from a painful neuralgic affection of the right arm; and at the urgent entreaty of Monsieur Bodin, I at length consented to visit one of Doctor Chapelain's *Somnambules*.

I shall never forget that remarkable scene. My opinions, I must premise, were at that period strongly opposed to animal magnetism; and I went accompanied only by a female friend, completelely *incog.*, and with a determination to remain so, and to detect, if possible, any attempt at imposition. I was personally quite unknown to Dr. Chapelain, who received me as a perfect stranger.

I found the somnambule sitting on a sofa, apparently asleep, Dr. Chapelain put me *en rapport* with her, and after a long, acute category—my answers to which, as proving my scepticism, irritated her exceedingly—she gave a description of the *interior* of my arm, which Dr. Chapelain pronounced to be anatomically correct, though it was asserted, that in her natural state she had not the slightest knowledge of pathology. This, combined with many equally strange circumstances, confirmed my *unbelief*, perceiving which, she suddenly exclaimed:—"It is useless, you will not consent to try animal magnetism, which would perfect your cure this day six months—you will be a greater sufferer still—will go for change of climate to the south of Europe, and there" (naming the particular date) "will be ordered a medical treatment, which if submitted to, will probably cause your death." *All this was verified*—but so profound was my then contempt for her predictions, that it was not until after I declined to follow the prescriptions of the Genoese physicians, being terrified at their severity, that I accidentally remembered the prophecy of the Parisian somnambule.

Subsequently, I was most perfectly cured, *without the aid of magnetism;* but I confess, I was struck by the curious coincidence I have mentioned, and while in Italy, Germany, France, Switzerland, and Belgium, devoted a portion of my time and thoughts to the study of animal magnetism, assisted by many eminently intellectual persons in those countries who believed it.

I must not forget to add, that the Gallic somnambule magnetised my arm, the result of which produced in ten minutes a violent swelling of the fingers, which quite incapacitated me from using or even moving them.

At the moment this occurred, she uttered the most piercing shrieks, large tears forced themselves from beneath her sealed eyelids, she described with perfect accuracy the peculiar pain that I had felt,—but from which I was entirely relieved during her paroxysm,—and asserted that it was transferred to her own arm.

I can positively state, that from that instant, until the one when she was demesmerised, I was entirely free from any sensations even of uneasiness in mine. The moment she awoke, my torture returned in its original force. The *séance* lasted for a considerable time, and while it continued, the somnambule, in her attitudes, fluctuations of colour, and eloquence of language, seemed to realize at once the inspiration and contortions of a poetic sibyl.

The history of her life, as connected with the subject under consideration, is extremely curious, but as it is too long for insertion, I will give it to you *vivâ voce* when we meet.

It may appear strange, nevertheless it is perfectly true, that notwithstanding my personal experience of some of the effects producible by mesmerism, I continued a decided unbeliever for a length of time afterwards. Even the arguments of Monsieur Bodin, Dr. Chapelain, and other *savans*, followed by the accomplishment at Genoa of the somnambule's prediction, failed to terminate my scepticism.

It was not until after a seriously prolonged investigation of the effects of mesmerism on others, and a calm study of the subject, aided by the written and verbal testimony of some of the most sensible persons I have ever known, that my present opinions in its favour were formed. You have requested me to state those opinions, otherwise I should not intrude them.

I believe, then, in a certain electric action,—or perhaps fluid,—which vital magnetism, even without the slightest contact, can communicate from one individual to another, in proportion to the *volonté* exercised by the magnetiser, and the degree of nervous sensibility possessed by the magnetised; as well as in the development of a peculiar faculty—by many termed a sixth sense—revealed in sympathies, presentiments, and other phenomena, which though as yet but little understood, approximate to those described by Goëthe, in his powerful work on the doctrine of affinities.

I do not think it probable that we can ever ascertain the laws which govern and unfold this mystery of nature; but it seems to approach to instinct, so highly stimulated as to induce perceptions unknown to the senses in their natural state. The power of projecting the spirit into the future, or casting it into the past, while the human coil remains *pro tempore* in a state of living death, is indeed amazing; yet we can imagine that the soul, if unfettered from mortality,—as many assert it is during the mesmeric trance,—*may* have perceptions incommunicable to the organs of our senses when awake. At all events, the various phenomena of mesmerism are scarcely more wonderful than those of electricity, galvanism, and *mineral* magnetism. *Natural* somnambulism, with its accompaniments of sleep-talking and walking, as well as catalepsy, are recognized as facts within and without the professional pale of the medical world. Yet mesmerism, which seems but an extension of those wonders under the influence of an inexplicable and more potential agency, is rejected by many as being contrary to the laws of nature! No rational understanding doubts the extraordinary properties of the loadstone, yet the efforts of all philosophers have failed to elucidate the *cause* of its astonishing effects.

Who can prove whether the magnetic power exists in the stone or circulates around it? Who can explain why its influence acts so forcibly on iron, while all other metals are exempted from it, or why its greatest attraction lies in the two opposite ends denominated poles?

The most enlightened intellects have never attained a full and perfect knowledge of the properties of wind, light, and sound, or the actual nature of electric matter.

Who can prove how perceptions are formed, or explain the nature of life, or the influence of soul over body, and their mutual union? No examination of the human frame can discern the seat of the soul, which, though sentient and active, seems independent of space; yet, setting aside the indisputable evidence of Christian revelation, which not only declares its existence, but reveals its immortal destinies, no man can rationally doubt his possession of that inestimable gift from his Creator. Thus we have a decided conviction of the reality of countless profound mysteries, though we cannot penetrate their depths or explain their causes. And what greater claim does mesmerism make than an assent to the truth of its wondrous *effects*, which are daily demonstrated to our senses, though as yet the limited powers of the human understanding have failed to discover the source from which they emanate. But here it may be said, that the opponents of mesmerism deny what its supporters please to *call* facts. Now what are the main grounds for this negation? Assertions, in the first instance, of personal imposture, which nine times out of ten has never been proved, while thousands of astonishing cases evidencing the effects of mesmerism have been established beyond the possibility of doubt. It has been insisted upon, that because the believers of the doctrine do not all agree as to what mesmerism consists of, it cannot be true. This assumption scarcely deserves refutal. As well might such cavillers deny Christianity, because there are so many sects, and such various interpretations of the word of its divine author.

The objection which some excellent and devout persons have made to animal magnetism, on the principle that it is profane to attempt to unveil the hidden and sacred mysteries of the Creator, I approach with diffidence, because the source from which those samples spring demands respect; in adverting to them, therefore, I would only submit the following questions for the consideration of those who are of that opinion. If the objection they offer were carried out unto its full extent, would it not militate against the investigation of *all* the philosophic secrets in the empire of nature? Would it not deprive our faculties of their best exercise in endeavouring to attain a more perfect knowledge of the stupendous works of God, in order not only to benefit our species by the application of the results of that inquiry, but to increase our individual capability for more effectually comprehending His attributes and glorifying His name? However limited the powers of our understanding prove when exercised to fathom the phenomena of the universe, is it rational to conclude that the energy and comprehension of intellect, however finite, were given for any other purpose than that of leading us to the study of eternal wisdom, and of contributing our knowledge of its creations to the advantage of man? Public opinion to a considerable extent has thrown obloquy and ridicule on mesmerism from its pretensions to prevision, or *clairvoyance*, as it is more generally called. I approach this part of my subject with such a thorough conviction of my inability to discuss it, that I shall offer but a very few remarks. The whole theory of dreams, with their frequently prophetic character, " plurality of consciousness," and moral influence, affords a subject for metaphysical investigation, which has attracted the attention and employed the pens of learned men.

That our nightly visions are sometimes, though rarely, prophetical, and are formed in the faculties of the soul, notwithstanding its then comparatively inactive state, is maintained by many deep thinkers on the subject. Some writers avow a belief that a secret power exists in the essence of the soul when we are awake, which manifests itself in just presentiments of the future, and assert that a multitude of facts in the ancient and modern history of man place this beyond a doubt. Others again, with equal tenacity, maintain that the faculty of foresight is much more powerfully developed and proved in revelations during the calm of sleep; which doctrine approximates closer to that of the mesmerists.

My limited knowledge precludes my offering any opinion whatsoever on such abstruse conjectures; but for the consideration of those who treat the subject, which has received the sanction of philosophic inquiry, with unbecoming levity, I shall give the following extract from the work of a celebrated naturalist divine and metaphysician. " The soul has the faculty of representing the past as well as the present, why then may it not have the faculty of representing the future also? Why should we consider it an impossible thing? . . . . . There may be in the human soul *a certain power hitherto unknown*, which enables man to foresee distant and future events."

This paragraph gives a subject for reflection rather than for comment. I now turn to another and a very plausible objection that has been urged on the score of the serious evils which would result from a general, indiscriminate, and probably an unprincipled use of animal magnetism. Every one must acknowledge that destructive consequences would ensue were its practice not placed under proper restrictions. Our legislature has enacted decrees in regard to the adoptions and administrations of some of the most powerful drugs used in pharmaceutical treatment. What is to prevent animal magnetism from the benefit of equal protection? If the dangers which *may* result from popular agents were permitted to operate against their use, fire, opium, gas, steam, &c., &c., would necessarily be repudiated.

The relief and cure of physical suffering, which the advocates of mesmerism assert it can effect, and of which so many apparent proofs are extant, appeal most powerfully to the heart of every philanthropist. Is it possible that any sensible person, whose views are not narrowed by prejudice, pride, or interest, can refuse to admit the rationality—nay, the *necessity*—for examining the validity of a theory, from which it is asserted by a host of philosophical men, that such results may be obtained?

Is it a trifling social duty to ascertain whether, by the strength of volition, the stupendous influence of mental over physical power, and of mind over mind, aided by other properties of animal magnetism, can restore the sufferer from the anguish of disease?

Without assuming mesmerism to be a universal panacea for "all the ills that flesh is heir to," are we not, as Christians and philanthropists, called upon to investigate whether by its means the torture of surgical operations can be completely deadened to the patient, or whether their adoption may not frequently prevent the necessity of using the lancet or the knife? And if such blessed effects *can* be thus produced, is it philosophical to refuse to accept them, because we cannot discover an analysis of their principles, or the precise source from whence they spring? Many of the most important laws of physics are but very imperfectly understood even in the present advanced state of scientific knowledge; yet the complexity of ordinary phenomena does not operate against a belief in the natural, though hidden, process which produced them.

The most brilliant new discoveries have, on their announcement, been met not only with the greatest public ridicule, but with the most unjustifiable treatment.

The most honoured names among the benefactors of science are associated, as temporary victims, with such reprehensible conduct. Pope says,—

> ——— "All fools have still an itching to deride,
> And fain would be upon the laughing side."

But, unfortunately, not only simpletons and witlings, but men of comparatively good understanding, have been but too prone to join in such senseless attempts.

What vain efforts were publicly made to cover Dr. Jenner with unqualified ridicule, on his first announcement of vaccination. Had Franklin declared his discovery of a medium for drawing lightning from heaven to earth, *before* he had successfully performed the experiment that established this truth, would he not have been similarly treated, or regarded almost as a madman? What was the dreadful fate of Galileo for publishing the results of his sublime researches into the system of the universe?

If Harvey had fallen into a single error in his proofs of the circulation of the blood, and its admirable mechanism, would even his powerful intellect have screened him from the attacks of those, who either regard every prejudice as sacred, because it is hereditary, or, with a superficial acquaintance with the elements of general knowledge, repudiate every appearance of innovation? How many mistake assertion for argument, ridicule for reasoning, and presume to condemn each new research into the vast domain of nature, and to reject the hypothesis founded thereon, without having tested its truth by a patient and candid examination.

Hitherto, I regret to say, that in England, notwithstanding her intellectual wealth, every first attempt to investigate the secrets of nature has thus been generally sneered at as folly; nor is it until a series of facts establish a theory beyond a doubt, that she receives it as a truth, and consequently often follows other nations in the path of science in which she ought to have preceded them. Now, however, a spirit of inquiry and experiment is the spirit of the age; and this, through the glorious medium of a free press, powerfully assists the promulgation of new and unexpected discoveries, and reveals the defects of many ancient theories. In short, the recent remarkable progress of the light of science is rapidly dissipating the gloom of ignorance, prejudice, and error, among the mass of mankind. Novel systems and establishments are arising,—old ones are either mouldering into dust, or adapting themselves to the changes of opinion that are going on in the world, and which no human power can arrest. Such being the case, why not grant a fair consideration to the truths, or, as some will have it, the pretensions of mesmerism? The wisest of the wise, after careful study, have believed in it, and names which shine as guiding stars in the horizon of our literature, have dignified its cause by their support.

I have much pleasure in recording such a mass of brilliant evidence in its favour, but I should be deficient in candour if I failed to express my conviction, that animal magnetism, perhaps more than any other subject, opens the door to the fanciful, and often absurd, flights of over-heated imaginations, to the impostures of the self-interested, and to the presumptuous ignorance of the charlatan.

Many of the grandest truths are, from their nature, *incapable* of absolute demonstration; and mesmerism being of that class is more likely to be injured by the injudicious enthusiasm of friends, in attempting to explain its mysteries, or in exaggerating its wonders, than by the most determined enemies in disputing them. But the abuse of a science is no argument against it, and surely ought not to injure, *per se*, the one we are considering. As well might we assert, that, because superstition and priestcraft exist, there is no such thing as true religion!

How is judgment to be formed except by an accurate comparison of facts? By that test, and that test only, animal magnetism must stand or fall. It has now become a public question. To repress its discussion, even among the ignorant and the vulgar is impossible; therefore, it is high time to bring it to a final issue.

The learned members of society, and the medical profession in particular, are imperatively called upon to do so; the latter, distinguished as a collective body by the attributes of science, skill, and humanity, it is therefore to be hoped, will take an active part in performing this duty to their country.

Physicians are the very class the most especially fitted by education to fulfil it; and if the upshot of their inquiries be a decision in favour of the claims of mesmerism, they would undoubtedly be its ablest practitioners.

Committed into their united hands, protected by law from indiscriminate use by less qualified agents, evil, then, could never counterbalance good in its administration. Had time and the obligatory limits of this letter permitted, I should like to have entered more largely through the boundless field of inquiry, into which the consideration of animal magnetism invites the mind to enter.

In particular, I should have wished to describe a *séance* at Antwerp, when the singular connexion of mesmerism with phrenology was curiously illustrated; and another, to which I was introduced at Brussels through the courtesy of Le Chevalier Jobard, director of the Museum, and honorary president of the Belgian "Academie de l'Industrie." This gentleman's scientific writings, and his appointment to the various official situations he so ably fills, are sufficient guarantees for the extent of his acquirements, and the strength of his intellect. The power of both is unreservedly given to the support of animal magnetism, in which he is a firm believer.

The bounds necessarily placed to my remarks, now oblige me to bring them to a close. By high authority in the world of letters I have been called upon to make that public, which was originally intended for a more private circulation, and have not shrunk from the performance of a request which I think involved a social duty. If what I have said shall lead one sensible mind to the dispassionate consideration of the subject I have treated, my pen has not been wielded in vain. With the certain knowledge beforehand, that to write in any degree in favour of mesmerism may subject me to the penalty of being denounced by many as a dupe or an enthusiast, I have done so; and have also the moral courage to avow that I cannot be indifferent to its progress in public opinion.

I say this, because I think that, however perplexing its effects may be, and however obscure and unexplained its cause, yet, as presenting extraordinary illustrations of the history of mind, and as leading to the discovery of physiological truths which may ameliorate human suffering, mesmerism is fraught with interest; interest neither unphilosophical nor transitory, but akin to that awakened in the soul, when it soars to the contemplation of those profound mysteries in the book of creation,

which emanate from, and teach us humbly to adore the great and incomprehensible God.

Ever, my dear Sir,
Yours very sincerely,
M. G. S. C.

À MADLLE. MADLLE. C———, RUE DE RIVOLI, À PARIS.

Ma chère Mademoiselle, (s'il est possible de traduire l'Anglais de cette façon,) je suis allé ce matin chez le Docteur Chapelain pour lui faire part de la curiosité qu'a le Docteur S. de voir des faits magnétiques. Je lui ai exposé en même temps l'importance qu'aurait la conviction de ce medicin Anglais distingué, sur l'opinion de madame votre mère et sur la vôtre. Il offre de la meilleure grâce du monde, de se prêter au désir du Docteur S. tant que l'occasion le permettra. Il fera en sa faveur une exception à la regle qu'il est obligé de se prescrire de n'admettre d'autres témoins du traitement de les malades que leurs amis ou parens.

Le Docteur S. peut aller de ma part et de la vôtre chez Monsieur Chapelain quand il lui plaira, vers midi. C'est l'heure où trouvent ordinairement les Somnambules.

Il s'y rencontrera un Americain traité pour Epilepsie, et dont le Scepticism est obligé de céder à l'evidence de la sensation.

Chemin faisant s'il a quelque patience il recueillera *une foule des faits* qui certainement le convaincroit aussi. Je l'engage donc à ne point négliger une offre precieuse, car il s'agit pour lui de savoir à quoi s'en tenir, sur *ce que je crois, le plus important des sécrets de la nature*. Pour moi je tiens à ce que ni lui, ni *vous* n'ayez plus aucune doute sur ce point, et je vois là le meilleur moyen de vous donner la santé.

Le Docteur C. m'a prêté pour vous et pour son confrère Anglais, un volume où le trouve la traduction d'un Mémoire sur le Magnetisme, par le Dr. Chenevix, Membre des Societés Royales de Londres, d'Edinbourg, et d'Irlande.

Le témoignage des Docteurs Ellis, Whymper, G. Smith, Brodie, Elliotson, Milligan, Riadore, Earle, &c., y est invoqué, des expériences faites dans trois au quatre hôpitaux de Londres y sont relatée.

Tout cela ne doit certes pas *établir la conviction* d'un bon esprit tel que la vôtre, mais cela peut la fortifier quand on a observé *des faits soi-même*.

J'irai vous porter le volume un de ces jours. En attendant je vous envoie un écrit fort curieux sur le magnétisme, et qu'il est impossible de trouver chez les libraires. Je connois l'auteur, et *j'ai été témoin* de plusieurs des faits qu'il rapporte avec une grande sincerité.

La Place, Cuvier, &c., avaient une conviction de la verité du magnétisme et cépendant vous êtes encore incrédule!

Je vous écris de la Chambre des Députés, et priant *la formalité Anglaise* de passer sur l'irrégularité du *Cachet.* Je n'ai point de cire dans ce moment, et je suis réduit à *l'anti-gentlemanly* pain à cacheter!

Voilà une apologie aussi ridicule que l'usage Anglais qui le rend nécessaire.

Croyez Mademoiselle à ma sincère amitié, mon profond respect, et ma plus haute considération.

FELIX BODIN.

De la Chambre des Deputés,
13 Fevrier.

Notre ami le Docteur Bowring est ici. Je n'ai pas encore cherché à le voir. Veuillez présenter mon respect à madame votre mère.

REMARKS UPON THE MARINER'S COMPASS.

BY MRS. BORRON.

HER Majesty's harbour-master, Mr. Walker, has, I observe, done me the honour to notice in the Nautical Magazine for November, some observations of mine published in the Polytechnic Review, upon his proposed plan for correcting the aberrations of the Compass. As there are some considerable inaccuracies both in his calculations and philosophy, as regards my statement, I beg to be allowed an opportunity for correcting them. Mr. Walker notices my observations as follow:—

"In the Polytechnic Review for July, 1844, there appears an article 'On the Aberrations of the Mariner's Compass on board ship.' The writer it seems has read my pages in the Nautical, and certainly without sufficient attention. I entirely disapprove of a multitude of needles on a single Compass card! This critic has neither read my papers with sufficient attention, nor has she clearly understood what she intended to say; her remarks on magnetism are not put into such a form as to call for serious refutation. I would by no means discourage Mrs. Borron from following up her scientific pursuits, she is a lady of considerable ability, and deserves encouragement. She is however wrong in her arithmetic, when at page 41 she tells us that a velocity of 20 feet in a second when 'carried out,' will amount to 13¾ miles per hour! Why, Sir, when a ship is going at the rate of 20 feet in a second, she is actually going at a less rate than twelve knots an hour. My fair critic is equally at fault in her hydrostatics and opinions about the height and motion of waves at sea; she thinks and gravely asserts that the descent of a wave cannot be more than ten feet in a second, and that water can only fall through the atmosphere a distance of sixteen feet in the first second. In making this hasty statement, the writer overlooked the fact, that although the vertical height through which a falling body descends in the first second, amounts to sixteen feet, yet its terminal velocity will be at the rate of 32 feet per second! This is a subject which has never been thoroughly examined, and I will 'condescend to a few facts and figures relative to waves at sea.'

"1st. The atmosphere presses with an elastic force of about 2000 lbs. upon every superficial foot of the surface of a wave, and this downward pressure is in addition to the weight of the water forming the wave.

"2nd. It has been ascertained and recorded, that waves at sea travel along at the rate of 46 feet in a second of time, or 27 miles per hour.

"3rd. That the elevation of such a wave was found to be 27 feet above, and its depression 27 feet below the mean sea level.

"4th. That the waves in a storm have reached the lanthorn on the top of the Eddystone lighthouse."

I will take this critique in the following order.

1st. As to the arithmetic, both mine and Mr. Walker's.

2nd. His observations on hydraulics, or water in motion, as in the velocity of the descent of a wave.

3rd. His idea of pneumatics, or the weight of the atmosphere acting on water.

4th. His statement of the velocity of the waves.

5th. His assertion that I have not understood his plan for correcting the Compass.

In the observations to which Mr. Walker alludes,

1st. I have stated that a velocity of 20 feet per second is 13¾ miles per hour: there being 5280 feet in a mile, if we multiply 3600, the number of seconds in an hour, by 20 feet, in a second, we shall have 72,000 feet; divide this by 5280 feet and we shall have 13 $\frac{4860}{5280}$ miles, or more than 13¾ miles. How Mr. Walker obtains less than 12 miles an hour from the same data I stop not to examine. His arithmetic is also incorrect as to the velocity of the waves of the sea, which he says have been ascertained to be 27 miles per hour; although he does not say by whom. Mr. Walker says this rate gives 46 feet per second: now, if we multiply 5280 feet in a mile by 27 we have 142,560 feet; divide this by 3600, the seconds in an hour, and we have 42 feet and about one-third per second, instead of 46 as given by Mr. Walker.

2nd. I have stated that water falls through the atmosphere during the first second 16 feet; Mr. Walker does not deny this, but says that the terminal velocity is 32 feet per second. I beg to observe that I do not speak of any particular part of the descent, but only of the average amount of time from the first moment of decadence to the last. We must also recollect that the descent of a wave from crest to trough, when most elevated by storm, as it is partially supported by other waves, cannot fall as freely as water through the atmosphere; and if it be taken at about two-thirds the velocity, we shall not be far from the mark, or 10 feet per second.

I have witnessed many storms on the Atlantic, in the German Ocean, and in the English Channel; neither being timid, nor subject to sea sickness, I have always placed myself on the quarter deck, to observe the most sublime of all the works of the Almighty, a violent tempest, for only "They that go down to the sea in ships, and occupy their business in great waters; these men see the works of the Lord; and his wonders in the deep."

Whilst contemplating these scenes, I have often observed with delight masses of the foam, arising from the breaking of the crest of the billow, chase each other down the side of the wave into the trough of the sea; and then, comparing this velocity with that arising from the *spray* of a billow dashing over the bows or sides of a vessel, I always found it much inferior.

> "Oh! for a soft and gentle breeze,
> I heard a fair maid cry—
> But give to me the snorting breeze,
> And the wild wave curling high!
> The wild wave curling high,
> The ship like an eagle free."

3rd. I now proceed to Mr. Walker's observation, that the weight of the atmosphere adds to the weight of the water in the proportion of 2000 lbs. to each superficial foot; the thing is too ridiculous to be asserted by the merest tyro in Natural Philosophy. Mr. Walker in the first place again commits an error in his arithmetic, for the pressure of the atmosphere on a *vacuum* being 15 lbs. per superficial square inch, the weight on a square foot of 144 inches being multiplied by 15=2140 lbs. instead of 2000. But air, like water, presses equally on all sides, and unless there be a vacuum as in a barometer, the pressures balance each other; and as there is no vacuum under a crested wave, the atmosphere passes for nothing. I will take an example which in its consequences must be self-evident to Mr. Walker. Suppose a man's head contains on the surface three-fourths of a superficial foot, or 108 square inches, this at 15 lbs. per inch would be 1620 lbs. Now, Mr. Walker in moving about must be quite sensible that he does not feel this weight upon his head: it is clear, notwithstanding his errors in arithmetic, in hydraulics, and now in pneumatics, that his head is not a vacuum, or it would collapse by the pressure; a demonstration which is not only satisfactory, but consolatory.

4th. I will next refer to Mr. Walker's assertion that it has been ascertained that the waves of the sea (in a tempest we suppose) have a velocity or rate of 27 miles an hour; although he does not say by whom this is vouched. Now, in such a velocity of the sea, a ship would proceed at the same rate, or it would not. Let me ask Mr. Walker if he ever heard of a vessel making that number of knots per hour; I will venture to say he never did. If a vessel in a storm only makes 10 or 11 knots an hour under bare poles, or otherwise, we must on the other hand admit that the waves running 27 knots an hour, she must be speedily pooped by a sea over her stern. However, I agree with Mr. Walker that this is a subject which furnishes data for scientific speculation; but not exactly such data as he subsequently introduces.

In entering upon this field we should first endeavour to ascertain what is the weight of a cubic foot of water of various depths, the momentum of the wind upon the surface of the water, and also how far below the influence of the motion of that surface is felt; it being clear that as this influence decreases, the velocity of the water below must decrease, and probably the waves must rise and fall in segments of circles, the radii of which will extend to a depth proportionate to the violence of the wind, and that the force of a wave will depend upon its magnitude and gravity, multiplied into its velocity. I very much fear, however, that were we to attempt to thread this maze, one or both of us might get beyond our depths.

In return for the patronising air that Mr. Walker assumes towards me, I will give him a calculation of the power of one of his waves of 27 feet high, and a velocity of 27 miles an hour, or 42 feet per second, not 46 as Mr. Walker makes it, and also of its effect upon a vessel of the size of the Inconstant, which I will assume to be 220 feet long and 30 feet broad, and say 1500 tons burden. We will also assume that on a wave overtaking the vessel, it is elevated on an average 12 feet above her quarter decks, and dashes forward 100 feet.

What is the weight of this portion of such a wave sweeping along the ocean? 100 × 30 × 12 will give 36,000 cubic feet; each cubic foot is 62 lbs., therefore, 36,000 × 62 = 2,232,000 lbs., or very nearly 1000 tons; to this must be applied the velocity per second of the wave, above that of the motion of the vessel. If the wave runs 27 knots, and the ship 12, the differential velocity would be 15 miles per hour, or 22 feet per second. As gravity and velocity multiplied constitute power,—not the square of velocity as Mr. Walker states,—22 × 1000 gives us 22,000 tons of power bearing on the vessel. This may appear an inordinate amount; it is however strictly correct, provided the premises had been sound; but this is not the case as concerns the velocity, and I have only adduced the foregoing to shew the utter absurdity of rating the velocity of the waves under any circumstances at 27 miles an hour. The velocity of a hurricane wind is stated by Smeaton at 120 miles per hour, but the air being 800 times lighter than water, could not, notwithstanding this velocity, impart 27 miles an hour to the latter.

Attempts are however making to weigh and measure the wind, although it is said, "None know whence it cometh, nor whither it goeth." If Mr. Walker is disposed to follow up his speculation on this head, he might procure, perhaps, a newly invented instrument called an Ane-mummery, some call it an Anemometer, which may be had, I believe, at the chief manufactory of this and such like nick-nackeries, at Plymouth.

By this ingenious trap I am informed, that a descendant of "rude Boreas," with which Incledon used to shake the seats of the gods at Drury Lane, was lately caught at Greenwich, and actually weighed 17 lbs. per superficial foot. But seamen are not philosophers; my immortal kinsman, Lord Nelson, was only anxious for the winds as they might bring him face to face with his country's foes.

With regard to Mr. Walker's remark, that the "waves in a storm have reached the lanthorn on the top of the Eddystone Lighthouse," I beg to say, that I have lived five years near the Lighthouse, and had it constantly in view; I have witnessed many tempests, and the tide rising 22 feet, yet I never saw this phenomenon. I apprehend Mr. Walker means the "spray" of the sea, and not such waves as he would describe as indicating the surface of the ocean.

Mr. Smeaton conceived the form of the present Lighthouse from the trunk of a large oak. He observed that the figure of the tree, as connected with its roots, rose from the surface with a bold swelling base, which at height of one diameter, sometimes diminished to half its original size. Hence he deduced the proper shape which a column of the greatest stability ought to assume, when the quantity of materials which composes it is given.

The Eddystone Lighthouse is 26 feet in diameter, and 100 feet in height. The rock itself presents an inclination to the wave of about 11 feet in 24, or not quite 45°. Water, on striking an object, is known to take, like light, a deflected angle, similar to the angle of incidence, therefore the waves striking on this base would receive a determination upwards of perhaps one-third the height of the Lighthouse; the water so thrown upwards receives a second deflection from the nearly upright shaft of the Lighthouse, which occasions it to rise with an inclination towards the sea from whence it was derived; and the wind then acting on the *spray*, I have not only seen it carried as high as the lanthorn, but over the top. Of course the "*spray*" is not the "*wave*," and the wave itself under such circumstances is not to be taken as an example of the altitude of the unopposed waves on the surface of the ocean.

If the facts relating to the Eddystone and the waves are such as Mr. Walker represents, I presume he may have sailed alongside the lanthorn, and hailed the astonished inmates with "Watchman! what of the night?"

But enough of philosophy; I will now acknowledge with great humility, that I was wrong in supposing that Mr. Walker was the distinguished inventor of *a compass card with eight needles!* which I now perceive is due to a Commission appointed by the Lords of the Admiralty; and that subsequently Mr. Walker was directed to fit a Compensator on the under side of one of the compass cards, having *eight needles* under it. And Mr. Walker now states that he does not approve of eight needles.

From the experiments that I have made and stated in the Polytechnic Review of July, I have sufficiently shown the inutility of this invention of the Commission. I will now, however, say a few words on Mr. Walker's Compensator, and its mode of suspension, as described by himself, page 157 of the Nautical Magazine for March.

It appears to me, that this addition to the working of the compass card, must increase the friction; and the experiments Mr. Walker afterwards details, page 161, made at the Admiralty, prove this opinion.

From the first set of experiments, the oscillations of the common card single needle were far more than either the rectified card, or the same in double suspension.

By the second set of experiments, the card of eight needles made more oscillations than the rectified card of the same number of needles; and a common card of one needle, single suspension, made double the oscillations of the same in double suspension. It appears evident, therefore, that the increased friction of Mr. Walker's apparatus diminishes the vivacity of the needle or needles: by this means it will no doubt diminish the effect of the local magnetism of the ship; but this greater steadiness or sluggishness is a great drawback on the directive power of the magnet. If this be so, the exuberant vivacity of the invention of the Commission of the Admiralty, might have been restrained by simply using a less polished cap, or an obtuse pivot, instead of by the curb and martingale of Mr. Walker.

I am still of opinion, that the insulation of the compass card may be effected by means which I believe have been untried, excepting by myself. Upon this subject I have addressed the Admiralty, but have met with no encouragement.

THE FRESCOS FOR THE NEW HOUSES OF PARLIAMENT.

As the New Houses of Parliament are approaching towards completion, it becomes a subject of deep interest to all lovers of art to ascertain what precise course the Committee mean to pursue in regard to the frescos which are to adorn the walls. It would certainly be a proud thing for the artists of England to be able to decorate the noble pile without foreign assistance; but, at the same time, it ought not to be forgotten, that the attempt would be an experiment in a hitherto untrodden path of art, and that failure would be as disastrous, as the success would be extraordinary. It is a well known fact that the art of fresco painting is not the birth of a day, and that it requires for its due exercise, an amount of skill and experience of which the great majority of people have a very inadequate idea. Not long ago two painters were despatched from England to Florence to learn something of it, and the expedition created only a smile amongst the veteran artists, who knew full well that as many years were required to accomplish the object, as the parties had weeks at their disposal. We have had already two exhibitions to forward the matter. The first, that of the Cartoons, displayed a degree of talent, both in drawing and design, that astonished the public. But the exhibition of fresco painting, which has since taken place, has only served to convince all who have studied the magnificent creations of the great masters, ancient and modern, how much has yet to be learned in this country before we are in a condition to make any thing like progress. It is no disparagement to English art to say thus much; because it has never yet taken this direction. We cannot fix on one of the vast public edifices which are scattered over the kingdom, that have had a pencil applied to their walls; while large canvass paintings are even rarely to be met with. Then again, how many private mansions are decorated with frescos? and how many of these have been executed by English painters? A proper answer to these questions will indeed prove that this kind of painting is not within the ordinary sphere of an artist's occupations. It has, in fact, been totally neglected hitherto, and is but now attracting some attention.

This was not the case during the revival of art. The covering of large surfaces with scriptural or legendary subjects, was a favourite means of teaching with the religious orders of the Roman Catholic church, and it was the Franciscans of Assisi who may be said to have given the great impulse to fresco painting by employing Cimabue and Giotto to adorn their conventual buildings with some of the earliest specimens in existence. It is, however, at Padua that the high excellence to which Giotto and his school had attained, may best be judged of. The chapel which bears his name is painted all over with a very remarkable series of sacred subjects. The design and expression of most of them are deeply touching and effective, while the drawing and colouring are much better than their early age would lead us to expect. A careful study of the works of the early masters, particularly those already mentioned, will prove one very important thing, namely, that they had a thorough insight into their subjects, and that they were in the habit of studying them in all possible lights. It is true these were entirely of a religious character; but this circumstance, while it accounts for the high perfection which they exhibit, also proves that such perfection cannot be attained without a sincere and heartfelt appreciation and love of the sentiments to be pourtrayed. It would be no difficult matter to enumerate many examples of such depth and beauty of feeling, shadowed forth in those comparatively rude works, as we should in vain search for in the more finished productions of the present day. The true artistic spirit existed then in its full youth and vigour, while the accessories in which it manifested itself were struggling painfully into existence. We may learn from this, that an earnest loving soul possessed with ideas of which it *must* deliver itself, is the true foundation of all art, as well as of all literature. There must be ardent sincerity of purpose. There must be an entire absence of all sham and pretension. It ought never to be forgotten that art, like literature, ought to teach as well as to please; and if the artist aims only at the last, he descends from his high vocation of dealing with man's spiritual nature, and becomes neither more nor less than the inventor of a new pleasure, the pamperer of some sensual feeling more or less refined. It is said to have been customary, at that early period, for the artist to seclude himself from society, and to give himself up to fasting and prayer for some time before he was permitted to deal with any sacred subject. He was required to free his soul from all impure thoughts, and to dwell with fervour upon the theme which he was about to develope in picture. This process is perfectly consonant with right reason, and is the very one adopted in principle, at least, during the composition of a sermon. There is, besides, a remarkable similarity between the two cases, in so far as the object in view in each is considered. The highest end of both is to instruct, the one conveying its ideas to the mind through the eye, the other through the ear. And just as in a sermon, "thoughts that breathe" may be conveyed in a comparatively rude dialect, so in a picture the religious emotions may be deeply moved, although the drawing be faulty, and the colouring far from harmonious. It is thus of paramount importance, not only in religious subjects, but in all others, that the painter should have his mind deeply imbued with the spirit of his work. It is the one thing needful, without which the most finished picture can never do more than please the eye. Any one who visits our popular exhibitions may easily see to what an extent this essential requisite is wanting; and it becomes a matter of importance to consider how it is to be restored. There appears to be but one method, and that is to resort to the same process of study of the old masters as was followed by Perugino, Raffaelle, and all the other artists of the most advanced era. The product of this study, however, must not be imitation; which is too often the only result. The painter ought to learn the principles on which the subject has been treated; he ought to compare carefully the historical fact with the artist's interpretation, and endeavour, if possible, to get a somewhat similar grasp of it, and he will then be able to render the same subject in a similar spirit. The works of Giotto alone would furnish occupation for a lengthened study; independent of the exquisite productions of Beato Angelico, Ghirlandajo, Masolino, Masaccio, and others. These, which are nearly all in fresco, exemplify the manner and sentiment of religious painting at a time when it was a work of piety and love. They equal any, and excel most, in force and truth of expression, though as works of art they are far from perfection; but it is just for this very reason that they are so worthy of careful study. Fine forms and delicate colouring are apt to cover the deficiency of poetic power in a picture, and it is well to be able to appreciate the effect which a few comparatively rude lines can produce when drawn by the hand of consummate genius. Some indeed display more accuracy of drawing and colouring, especially those of Masolino and Masaccio, who lived at a later period, when the formative departments had arrived at a more advanced stage.

The perfection of all painting is that which unites the perfection of expression, form, and colouring; we find a gradual approach to this union up to the time of Raffaelle, and we occasionally meet with it at a subsequent period. It is of importance to our subject to point out that one of the earliest, if not the very earliest, of Raffaelle's works, is a fresco at Perugia, in the same building with the beautiful frescos of his master Perugino, which proves that in this department of art he had arrived at high excellence, before he had produced a single known oil painting. The subject is only a small one, and would not necessarily involve any great difficulties in the execution; but it nevertheless exhibits marks of the sublime and solitary genius of the painter, and none but such as he could have produced it at so early an age. Fresco was one of his usual occupations to the very day almost of his death. It was the custom of the age in which he lived to employ it extensively as a decorative art. The times had changed since the reformed Franciscan order, 200 years before, had consecrated painting as the handmaid of religion. Piety had decayed, and given place to a kind of half pagan sensualism, and it is the opinion of some eminent artists, that the perfection of the religious type is to be sought for at an earlier age than that of Leo the Tenth. However this may be, there can be but one opinion as to the works with which that munificent patron adorned the metropolis of the Catholic world. The glorious frescos of Raffaelle and Michael Angelo are still, perhaps, the greatest triumphs of the pictorial art, although time and accident have dimmed their pristine beauty. Many of the subjects are not strictly religious, some of the best of them are not so; but the genius of Raffaelle could grasp all kinds of events with equal power; and his exquisite perception of form and colour enabled him to clothe them with a grace and beauty peculiarly his own.

The great painters of that golden era were also great men. Their peculiar art was but one manifestation of the intellectual strength with which they were gifted. Look, for example, at that Titan, Michael Angelo, gigantic in all his conceptions; triumphing equally in painting, sculpture, and architecture, and leaving the impress of power upon them all; or at the gentle Leonardo, a man of universal genius, and who might have been great in any walk of life. It is these, and such men, who have left the rich legacy of their works for the instruction and admiration of all ages; and it would be well if they were better understood, and used as incentives to the creative faculty in other minds, rather than as models to be slavishly copied.

It was in such hands that painting in fresco took its final and perfect form. The peculiar difficulties of the art were met and overcome by men every way competent for such a task; but it required such men to do it; and the best of their successors, even Corregio and Domenichino, though they have approached, have never equalled them.

After the decline of art, the cultivation of fresco was still continued at intervals, and with very various success. Fables from the Pagan mythology, crowded with fantastic groups of gods and goddesses in all sorts of impossible attitudes, and unmeaning combinations, were painted over the roofs of halls and salons, for no more evident purpose than to strain the necks of the beholders in the vain attempt to unravel the artist's intention. They were the work of another generation; in some respects possessing a degree of merit, but marking the downward progress of the pictorial art.

In our own country, as has been already said, we have had nothing worthy the name of fresco. The spirit of Protestantism forbidden the application of it to religious subjects; and hence those very themes to which we are to attribute its origin, are excluded by common consent from the province of painting.

During the dark ages, there was no literature for the people. Printing was unknown, and manuscripts were the property of the wealthy alone. The great mass of mankind were therefore left to learn their religion from the imperfect oral instructions of priests and monks, who were generally themselves of humble attainments. The great mysteries of faith were of difficult comprehension, to men who were more accustomed to rude violence than to the exercise of reason or the affections; and no doubt the beautifully pathetic delineations of scripture subjects by Giotto, or the terrors of the judgment day of Orcagna, or the truly celestial visions of Beato Angelico, were more likely to impress the feelings than the imperfect enunciations of wandering preachers. The light of Protestantism, however, has rendered such representations no longer available; while the abuses to which they gave rise, have made us look upon them with a jealous eye.

British artists must therefore choose other subjects for the exercise of the pencil; and it was a noble idea to throw open all the treasures of the national literature and the national history for every one to make his own selection. The British Parliament, the most important and august legislative body in the universe, has willed that the noble palace now erecting for its reception shall become a monument of national art. Is fresco painting in such a state among us that our artists can accept the challenge? How long has it been studied and practised in England? Where are there such specimens to be seen as might be considered worthy to occupy a place in the senate house? Would the best which the late exhibition contained be worthy of such an honour? These are important questions, and ought to lead us to a careful examination of the whole ground before any thing be done which might in time occasion deep regret and disappointment. When a painter is commissioned to execute a picture for a private individual, it is of very little consequence what may be its real merit, provided it satisfy the purchaser. If his expectations be fulfilled, the primary object is attained. If the picture be one of first rate excellence, there are many chances against the public ever benefiting by its exhibition, and should it be a bad specimen of art, it is equally excluded from view, and can do no harm. But it is not in this way that great national undertakings ought to be judged of. The fairy scenes of our early poets have to be pourtrayed; but if done at all, they must be handled in a kindred poetic spirit. It will not do to reflect those beauteous images through a medium corrupted by the perceptions of the present time. There must be no heretical interpretations of the great master works of our literature. The painter must recollect that his office is to edify and instruct, which is just one of the most difficult functions to fulfil in this matter-of-fact and utilitarian age. It at first sight appears almost hopeless to expect excellence in this, when we consider with what toil and affectionate labour it was formerly attained. The spirit of the subject ought to be deeply and earnestly studied, by a heart open to receive its beauties. The seclusion of the religious painter is not needful; but rather an intercourse with those scenes which inspired the poet's muse and filled his mind with imagery. We can conceive it possible in this way to attain somewhat of the true poetic flame; but still if the divine spark be not implanted by a higher hand, there will be but a feeble glimmer instead of light.

In short, to be a painter of such subjects, there is something more wanted than even the most perfect execution, and the most consummate knowledge of artistic rules.

The great events of our national history have also to be unfolded, but before this can be satisfactorily accomplished, there must be an adequate knowledge of that history; and a thorough perception of the spirit of the age in which the particular event occurred. This can only be attained by adequate study, and that of a different kind than can be carried on with ordinary historical works. There must also be a thorough national spirit in all such paintings. They ought to call forth a responsive patriotism in all intelligent spectators. No work of art is worth the trouble of execution which does not speak to the sentiments in addition to the pleasure which it may afford to the senses; and yet it is very questionable whether these all-needful preliminary qualifications be in the possession of more than a small proportion of the living artists of Europe. It may be said, that the standard required is too high for attainment; but we would answer that unless the aim be lofty, the performance will not rise above mediocrity; and unless it far exceeds that, it were better to consign the walls of the Houses of Parliament to the hands of the house painter, than to desecrate a department of art which has exercised the pencil of some of the greatest geniuses that have ever lived.

We have as yet said nothing of the peculiar difficulties of the manual operations of fresco. They are great, no doubt, and require long practice and correct judgment to overcome them; and it is for this reason that much more experience is required than has fallen to the lot of our artists; at least, if we may form a judgment from the success with which they appear to have been met in the exhibited specimens. Years of patient study and devotion to the one object would not be too much before great works are attempted. And for the purpose of obtaining a thorough knowledge of practical detail there is no school like that of Munich, where fresco painting is employed to an extent altogether unprecedented except during the age of Raffaelle, and with a degree of success that is as gratifying as it is wonderful. Every one knows the exertions which have been made by the present King of Bavaria and his father for the purpose of reviving the fine arts in Germany: and amongst these, not the least has been the establishment of a school of fresco painting, which has already produced works of the very highest excellence. The royal palace of Munich, when completed, will be a monument of art, such as it is intended to make our Houses of Parliament. It is already decorated with splendid specimens of fresco illustrative of the German national annals, and early poetry. One large suite of apartments is dedicated to the illustration of the Niebelungen Lied alone, and although only two of them are in the process of completion, they are even now sufficient to stamp the genius of Schnorr with immortality. In the whole circle of painting there is perhaps nothing finer, nothing more beautiful or gracious, than the group of Siegfried and Chrimhilda. It is one of the few paintings which transcends the conception which it is intended to pourtray. It is evident that the whole work is the result of a highly poetic interpretation of the old song, by the hand of a master who has entered into all its beauties, while he loves it as a fragment of peculiarly national literature. There is another suite of apartments adorned by noble paintings of subjects from German history, which are particularly worthy of study from the patriotism which breathes through them all. The feeling of nationality is growing stronger with every year all over Germany, and it is this sentiment which has inspired these fine works, and which pervades them in every line. To the German they have a peculiar charm, because they speak to him in intelligible accents of his father land. There is no straining after effect: all is simple and natural. The incidents are well chosen and effectively told. The colouring good, and the knowledge of the rules peculiar to fresco perfect. The same building contains a series of subjects by Cornelius, illustrative of the Greek classics. They are small, and well painted, but not so striking as the others. The palace at Munich affords ample opportunities for study, and it would be well for artists who expect employment in the Houses of Parliament to avail themselves of these before entering on their work.

In the immediate vicinity of the palace is the church of All Saints, built upon the Byzantine model, and not unlike some parts of the church of St. Marc at Venice. The roof and arches and part of the walls, are gilt, and contain a very beautiful series of paintings in fresco, by Hess. The subjects are chosen from the Old and New Testaments, and the legends of the Roman Catholic church. They consist of groups of figures, painted on the gold ground, in imitation of the early Byzantine mosaics. These paintings are remarkable as exhibiting a successful attempt at the revival of the religious style of the middle ages. The artists of Munich and Dusseldorf, have taken their type before the age of Raffaelle, and here followed the model of Giotto and Beato Angelico. They have not, however, been slavish copyists, but have united the style of sentiment presented by those old masters with better drawing and colouring than were prevalent at that age. These are perhaps the most finished and effective of all the religious paintings of the present time. The peculiarly touching and pious expression of the religious school is admirably rendered, along with great chasteness and simplicity of treatment.

There is also a magnificent Basilica, which is at present being adorned with frescos from the legendary life of St. Boniface. Some are finished, and others are in different stages of progress. They are by Hess and other artists, and are also very favourable specimens of the religious style. The Glyptothek has been painted in fresco by Cornelius, who has chosen a series of Grecian subjects as most appropriate to the building, which is a gallery of ancient statuary. They are generally not so successful as the examples already given. They are rather hard in the execution, and appear to have been painted at an early period of the Munich school.

Taken as a whole, these frescos are the best of modern times, and they distinctly prove that the art may yet be cultivated with as great success as ever. We only want the men and proper training; and this brings us to what, in our opinion, would be the best course to follow with regard to our Houses of Parliament.

It is quite clear that no proof has yet been afforded that our artists are competent to undertake and finish satisfactorily the great national works in contemplation, and this, as we have already said, arises not so much from want of talent as from want of experience. There are but two courses left open. The first of these is to employ competent German artists, so as to get the work finished as soon as possible. This would no doubt be the readiest and most successful method, provided we were sure that they could enter as thoroughly into the spirit of our national annals and literature, as they have done into their own. It is very doubtful, however, whether this would be the case: so that the only evident advantages would be, that the frecos would be sooner executed. But, after all, is this rapidity at all requisite? We think not. The works at Munich have been many years in progress, and do not all exhibit the same degree of talent. Indeed, this is no more than we might expect, when we remember that the late King of Bavaria had to form a school for the purpose, and find means for it: and surely what he has been able to do, our government could effect.

It is really high time that we should be thinking of other functions of government, than merely keeping some thousands of men with red uniforms to fight battles *in posse*. But as we have not yet entered upon the very threshold of education, it is, perhaps, too much to expect great efforts for the encouragement of art. We feel assured, however, that amongst the means of moulding the character of a people, there is nothing more efficacious than the cultivation of the artistic spirit: and here we have a noble opportunity presented of beginning the good work, which, if properly improved, will leave its impress on British art for ages to come. Let these frescos be only successfully executed, and it will soon be found that a demand will arise for others all over the kingdom. There is wealth enough to pay for them, and the fine arts will thus receive a degree of patronage such as is sought for in vain, from art-unions and other similar expedients.

In our opinion, then, the only way to meet all difficulties is to form a British school of fresco painting. The object is every way worthy of national support, and indeed, without this, we can see no method by which the Houses of Parliament can be decorated in a worthy manner. The frescos *must* be executed, so that there is already a demand for talent. It so happens, that our artists are inexperienced; but at the same time there is a great school in Germany to which access can easily be obtained, and where all the processes of the art are carried on in perfection. We do not consider that it would be at all derogatory to our most talented countrymen, to ask them to avail themselves of opportunities abroad which they do not possess at home. They would acquire the knowledge requisite to enable them to throw their whole energies into a new line of art, the cultivation of which would be attended with immediate fame and profit: but we should take a very limited view of the advantages likely to arise from this, if we did not also express our firm conviction that the labours of such an association would react on all the departments of painting. It is a remarkable fact, that art took its rise in fresco; that it was assiduously cultivated by all the great masters, step by step with their other works, and that the two branches arrived at perfection in the same hands and at the same time. It is almost superfluous to point out the great command and freedom which the execution of large subjects in fresco must impart, and so much was Michael Angelo convinced of its supreme excellence, that he considered it the only path of art worthy of a great painter.

Photographic Manual, No. 1. Willatts.

A useful compendium, descriptive of the art of photography, and embracing the best formulæ for the preparations used in the calotype and energiatype processes. It will enable the experimentalist, with the proper apparatus, to pursue this branch of knowledge.

A Thermometrical Table of the Scales of Fahrenheit, Centigrade and Reaumur. By ALFRED S. TAYLOR. Willatts.

A very useful chart has been laid out by Mr. Taylor, containing the most important facts which have been unfolded to us, with regard to temperature. He has given us the means of ascertaining at a glance, the mean temperature of the principal countries and cities, the temperature of the atmosphere on the summits of the principal mountains of the world, of the ocean at various depths; the evaporating, boiling, fusing, melting, subliming, and congealing points of solids and liquids; the temperature required for most chemical processes; the degrees of heat and cold borne by man and animals; the heat requisite for hybernation, germination, and incubation, for the cultivation of plants; and Mr. Taylor has, with great industry, and as much accuracy as the subject would admit, compiled, from the best authorities, a table of reference useful and indeed necessary to the natural historian, the chemist, the physiologist, and the mechanic. From the size of the chart there are necessarily many abbreviations, which at first sight seem to bespeak confusion, but after a little examination this vanishes, and we find ourselves in possession of the means of arriving at all the information Mr. Taylor is desirous of conveying.

The Last Rose of Summer preserved for my Friends; by ROSE ELLEN H. Kerr and Co.

The graceful introduction to this little collection of poems disarms all criticism. If there are many deficiencies to be found, so are there many of the qualifications necessary for the poet. Imagination exists, although the effort to express that which is perceived is too visible. The young lady is evidently highly accomplished, and we trust that the gentle dew of heaven will descend upon her rose leaves while they are giving their sweetness to the air, and that no pelting of the pitiless storm will overwhelm them, before they pass through the short existence to which the most beauteous of the floral kingdom are destined. There are some exquisite passages.

Sonnets, chiefly sacred; by P. EDMESTON. H. Brooks.

There is much poetic feeling, good taste, and sense of that which is just and virtuous in this collection of sonnets.

ROYAL GEOGRAPHICAL SOCIETY.

G. B. Greenough, Esq., in the Chair.

Monday, 13th Jan.

Eight new members were elected, and the following papers were read.

1. A Letter from Aden, of the 8th December, 1844, addressed by Lieutenant Cruttenden to the Rev. C. Forster, on the subject of the Himyaritic inscriptions in Hadramaut, and the nature of the ruins, still extant, of the once powerful nation of Himyari. At Hisa Ghorab, search was made for the last ten lines which are wanting to an interesting inscription upon a rock. It appeared, however, that the base of the mountain had been partially washed away, and the end of the inscription with it. Local circumstances seemed to prove that the spot had been inhabited at no very distant period. The cement of some of the more ancient constructions, either from age, from its particular nature, or the mode in which it had been prepared, had returned to its original state of limestone. The mountains around Hisa are so many extinct volcanoes, and it appears that volcanic action had formerly devastated what was once a fruitful soil. Below the mountain of Hisa there are many tumuli of the ancient people; but it would be impossible to open them without exciting the animosity of the Arabs. Lieutenant Cruttenden recommends the city of Káttabà, as the fittest place for commencing discoveries, from which, in a line eastward, the entire range of Himyari Castles that guarded the southern frontier, would be found. Exploration of every kind is, however, very difficult. It is impossible to make a sketch, or take an observation of the sun, without being suspected by the Bedouins of searching for hidden treasure; and Lieutenant Cruttenden generally promised them all the gold he should find, if they would only let him look at the sun in quiet. The writer goes on to mention the various places where there is reason to believe that interesting ruins of the Himyari empire may be found, and gives his opinion of the best way of getting at them. He says, the wonders of that empire and its people, are familiar subjects to every story-teller in Yemen, and the tradition of the transformation of the Beni-ód into apes as a punishment for their impiety, may yet be heard in the seräis and coffee shops of Southern Arabia; and yet, the only answer you can get from an Arab, when he is questioned as to the origin of these ruins, is, "They are the work of the 'Ián,' and of the Kafirs, in the days of Salüman bin Daoud." The

letter contained some fresh Himyaritic inscriptions, to be decyphered by the sagacious Mr. Forster, who has already done so much in making us acquainted with the historical facts recorded in the lost Himyaritic language.

2. The next paper read, was a very interesting and methodically drawn up description of the Island of St. Mary's, by Mr. Consul Carew Hunt. This paper cannot be abridged without mutilation; but we learn from it, that the Island of St. Mary's differs entirely in its geological relation from the other islands of the Azores, and greatly resembles Sicily.

3. The last paper of the evening, was on the freezing of streams in North America, by Mr. C. Anderson. This is a subject of great interest in physical geography, involving the great question of central heat, as affecting the temperature of springs, &c. The various phenomena present apparent anomalies, which are as yet not satisfactorily explained; among them the formation of "ground grue,"—a species of congelation which commences at the bottom instead of at the surface of rivers, and is not only common in Siberia and North America, but known in the Rhone, and even some streams of England, has given rise to various and conflicting opinions.

The reading of the papers was followed by a conversation in which many interesting facts were mentioned.

MISCELLANEA.

EFFECTS OF EARTHQUAKES ON CLOCKS IN GRANADA.

The St. George's Chronicle records a communication of Mr. Stephenson, that on the occurrence of the earthquake in that island on the 19th of January, those clocks, the pendulums of which oscillated from east to west were almost all stopped, while none of those whose pendulums vibrated north and south were affected. This distinct motion from east to west is a novel phenomena, but a still more strange effect is noticed in the Mining Journal, that during the same earthquake, the principal officers on board the Thames steamer, anchored then near the island, noticed that the compasses on board revolved on their centres with great rapidity. This last important fact will, we hope, receive the attention of the Electrical Society. We trust soon to have further reports.

ANASTATIC PRINTING.

An invention of considerable ingenuity, and of vast utility, is at the present moment attracting the attention of all those interested in the progress of mechanics and arts; and although a quantity of hyperbolical expressions have been employed which have rather tended to excite ridicule than serious consideration for the merits of this novelty, it is calculated to give an impulse of a striking character to the arts of printing and engraving. It consists of a process by which letter-press and engravings may be produced from an original to any amount required. As far as we are enabled to judge, the surface of a metallic plate is so acted upon as to receive an impression from the ink of any printed copy applied to it, and from this impression there may be taken duplicates almost without end. To the student of chemistry the first part of the process is not a matter of surprise, remembering the ingredients of which ink is composed. The second stage, or the means of conveying the impression from the metallic plate to paper, is less easily understood. Little attention has been paid by chemists to the typographic art, but that it is susceptible of great improvement there can be no doubt. As for the interference of government being called for by any of the alterations for our advancement which are going forward in society, the less meddling there is the better. Changes of property of all kinds are daily going forward; the occupations of all classes are constantly superseded by new inventions, and we have every reason to be satisfied with the general results. The inventor of this new typographical system deserves to reap the reward of his industry and ingenuity, and those who are the first to avail themselves of his plans must necessarily derive a share of the benefit.

CHEAP ILLUMINATION OF LONDON BY GAS.

Amongst the new ideas afloat in men's minds is the practicability of preparing the gas for the illumination of cities in the immediate neighbourhood of the coal pits, and transmitting it through suitable pipes along the lines of railway, giving in its passage branches to the different towns. Thus not only would the mischiefs resulting from the effluvia, and the smoke of the gas manufactories in the neighbourhood of large towns, be prevented, but the gas would be prepared at an infinitely cheaper rate than at the present time.

THE SALVAGE COMPANY.

Under this title has been formed another new company. The object is to rescue the treasure and property which has been wrecked upon the different coasts of Europe. The calculation is, that four millions of wealth are annually consigned to the sea. The number of ships lost annually is very great. In the years 1835-6, this interesting and important subject was investigated by a Committee of the House of Commons, who, in making their inquiries, selected two periods of three years each, viz. first, from 1816 to 1818 inclusively; and secondly, from 1833 to 1835 inclusively; and reported, according to Lloyd's books, that, in the first period, the total number of ships or vessels wrecked or missing appeared to be 1208; and in the second period 1702. About the middle of the last century, 100 vessels were lost in a single gale of wind at the port of Cadiz. Mr. Austin's invention is the one to be used by the company. It is different from the diving-bell: it is derived from the very simple and well known principle in natural philosophy by which a rarer fluid will not only itself ascend, but will also exert an elevating force upon another body so as to raise it, through a denser medium. Upon this principle, the bladder of the fish, when filled with air or exhausted, causes its body to ascend or descend (as the case may be) through water: and the application of the same principle to cases of salvage promises results far more complete and important than those obtained by the diving-bell.

TUNNEL UNDER LONDON.

We have received a prospectus for the formation of a company to connect the different railways by means of tunnels under London and Westminster. Not only do the promoters dwell upon the feasibility of the project, but they assert that it can be carried out at a very moderate expense.

THE DRAMA.

COVENT GARDEN.—MR. BETTY.—ANTIGONE.

THE most striking event in the theatrical world, since our last notice, is the opening of Covent Garden Theatre, under the management of M. Laurent, "for thirty nights only." Of course, this announcement was only looked upon as the result of a wise caution on the part of the venturous manager, the undertaking being looked upon as an "experiment;" and we are happy to add, that by all that we can judge of the result, the experiment appears to have been successful, and will be repeated.

The performance, on the opening night, "boxing night," consisted most orthodoxly of George Barnwell,—dreadful infliction of old school legitimacy!—and a pantomime, the name of which, as we do not signalise those of other theatres, it would be invidious to mention. The next adventure was the debut of Mr. Henry Betty, (son of the "Infant Roscius," of quondam celebrity,) in Shakspeare's *Hamlet*, and afterwards in Talfourd's *Grecian Captive*. Mr. Betty possesses,—and wants—several of the necessary qualifications for the impersonation of tragic heroes before a London audience,—an audience which, miserable as their present prospect is upon the stage, have recollections of the past, which render them fastidious in matters of this kind. The success of Mr. Betty was of that dubious character, which will render further practice in the provinces inevitable; and may yet warrant a return to the metropolis at some future period.

The third and most successful achievement of the management, has been the production of Sophocles' "successful and admired lyrical tragedy" of *Antigone*. Glorious old Sophocles! Noble Athenian! Little did thy ungrateful children think, when fancying you had lingered too long in this world of care, and woe, and wickedness, and thinking they could fill thy place better in thy possessions,—when they charged thee with living *too long*, and denounced thee at the police office, as being insane—a dangerous lunatic;—little did the ungrateful, piggish, young gentlemen imagine that some twenty-three centuries after thou and they were gone to dust, thy spirit and works would rise up in power and speaking life amongst a wondering nation,—a wonderful nation,—unknown historically or geographically in thy time! But it is even so;—and why? Truth is eternal, and can never die! *Magna est veritas et prevalebit!* True genius is truth itself; and as long as man is man, and men's brains fit in the same shaped craniums, and men's hearts beat in the same measure of time, and on the same principle of mechanism, their judgment and their feelings must respond to the genuine, massive, potent truth, of the glorious Sophocles! Reader, go and see,—or rather, go and listen,—for, according to the rules of the Greek stage, there is no fighting nor slaying on the stage,—there are no terrific combats,—no startling incidents;—but there *is* a crushing current of event, simply recited,—a thrilling terror of natural self-incurred calamity,—a close and obvious sequence of vengeful justice upon wilful wrong; and withal, a deep humiliation and abject misery in the bereaved and stricken victim, that is beyond all artificial incident or fabricated pathos. The acting of Mr. Vandenhoff and his daughter, in the principal characters, *Creon* and *Antigone*, was careful and energetic, and presented many points of remarkable excellence; but to say that it came up to the requirements of the parts, would be to go much beyond the truth. Mr. Archer, as *Tiresias*, gave the denunciations of the Seer with great gravity and propriety. The music of Mendelssohn for the choruses is for the most part fine and appropriate; full of tone and breadth, and like the poet's writings, characteristically massive. They were effective, particularly the "Hymn to Bacchus;" but only let us imagine what the effect of them—of the whole performance—must have been in the original rich, rotund Greek, amongst an ancient Greek audience, who looked upon these incidents and revelations as "Religious Mysteries:" only fancy them considering themselves, not merely spectators, but part of the chorus,—and how tremendous must have been the effect! 'Twas "Greek, meeting Greek," in those days! At the Adelphi, the spirited manager has produced a melodrama, the *Green Bushes*, in the best style, and with all the strength of the excellent Company.

GUANO—THE NEW FERTILIZER.

By William Walton.

On entering upon this subject, it would only be just to premise that it is to the spirited men of Liverpool, those intelligent and enterprising merchants who visit every accessible part of the globe, in order to exchange our manufactures for the productions of other climes, that the public are indebted for the introduction of this useful article, known to the Peruvians for centuries before the Spaniards discovered and conquered them. The early annalists, who transmitted down to us the details of those occurrences which distinguished the career of Pizarro, and of which several were eye-witnesses, agree in stating, that the aborigines of Peru were an interesting race, living in peace and plenty under the patriarchal government of a monarch whose chief study was the well-being of his subjects. Those secluded Indians had, in fact, attained a degree of civilization which astonished their assailants. Their cotton and alpaca cloths, in fineness and regularity of texture equalled any goods at that time made in Spain, and to both they imparted vivid and durable colours. Gold and silver were manufactured by them into articles of superior workmanship, and even in architecture they were found to excel. Finally, in arts and manufactures the Peruvians were as far advanced as the Chinese, when first visited by Europeans, and in other respects these two primitive races resembled each other.

In agriculture the children of the sun were consummate masters. Their lands were cultivated in common, and the produce when gathered in was divided into three portions, viz., one for the Inca and his government, another for the worship of the sun, and the remainder for the people. It was the Inca's duty to provide against the contingencies of famine, which he did by the establishment of storehouses in every part of his dominions, under the administration of responsible officers. The higher orders taught rural industry both by precept and example. Acting on the principle that the larger the quantity of corn grown, and cattle reared, by the lord of the soil, the more does he contribute to the maintenance of his fellow-beings, and in that proportion becomes useful to the community, no available ground was left neglected by them. Industry in raising the fruits of the earth, and economy in using them, were preached from the altar, as well as by the elders, and so anxious was the government to secure the growth of the most possible food for the sustenance of man, that agriculture was regulated and protected by agrarian laws. The Inca and the priests of the sun had lands and flocks of their own, and if, through an earthquake or some other calamity, the inhabitants were deprived of their usual supply of provisions or seed, they made up the deficiency. Hence the able working classes never knew the pressure of want. The helpless and infirm alone became objects of charity, and of them care was taken at the public expense. Besides the lands destined for the growth of corn, each family, according to its size, was allowed a plot of ground to raise vegetables and esculent roots. The Peruvians, in fact, practised what we call the cottage allotment system, and from it derived the greatest advantages.

But in vain would have been the provident care and patriotic exertions of the Incas, in organizing and upholding a practical system of agriculture, if they had not been providentially favoured by nature with an extraordinary means of manuring their lands. The long strip of country facing the Pacific, and once constituting the empire of the Incas, is composed of sandy valleys upon the coast, and in the interior of broken and barren slopes, excepting at intervals entirely denuded of vegetation. It therefore became necessary to economize all the available land possible, and even increase the quantity. On an extremely limited surface, the Incas had to see that food was regularly provided for eight millions of souls; the same surface that does not now support more than one. In order to effect this purpose, artificial grounds were formed on the Andes' slopes, by inclosing with stone walls the spots where the alluvial soil collected, after being washed down from the mountains by the torrents of rain with which they are periodically deluged. These inclosed hollows were their principal seed-lands, and here they grew their maize and millet, without any intermission, or alternation of crops. Manure of the most powerful kind consequently became necessary, and with this they were not provided by the domesticated animals usually frequenting our farm-yards. The Peruvians certainly possessed the llama and alpaca in considerable numbers, but in a country bare of wood they were obliged to use the dung of these animals exclusively for fuel, a practice prevailing to the present day.

To remedy this deficiency in manure, they had recourse to the droppings of aquatic birds, accustomed to congregate and breed upon their coast. The Pacific, more especially near the American shores, it will be borne in mind, is filled with fishes of various kinds, from the dolphin and flying fish down to the pilchard and anchovy, the two latter of which are constantly seen moving along in endless shoals. To feed upon this ready prey, at the peep of day myriads and myriads of sea-fowls of all sizes and descriptions, in families, leave the headlands and small islands to gain the offing. There, skimming the surface till they perceive a migratory shoal, they settle, and emulously begin fishing; on some spots covering the sea for miles round, and appearing like a dark cloud resting upon the waters. Here they dive and splash till they are gorged with food. In the course of the scramble, serious contests sometimes occur between the various tribes contending for the same prey, when the fishes, startled at the unusual bustle and stir above them, forsake the surface and take to the deep, leaving their pursuers in a disappointed and angry mood. These immense flocks of daily prowlers are composed of cormorants, pelicans, albatrosses, gannets, gulls, and petrels, with a variety of ducks and divers, all hungry fishers on the deep, independent of sea-swallows and shore birds. When fatigued by their efforts to procure a meal, they rest upon the surface, scarcely ever ruffled by the flitting breeze, till the sun begins to decline, when winging their way back to their accustomed haunts, and resuming their respective stations, these valuable assistants to the fertility of the land quietly await the process of digestion, next morning going forth to pursue their daily occupation.

Of the amount of these accumulations no estimate can be formed, and even if it could, the allowances to be made for waste and evaporation would baffle all calculation. That some remote idea may be formed of the quantity of fertilizing matter nightly deposited by these useful birds, it may suffice to say that the number of cormorants, pelicans, and albatrosses, the great gormandizers of the ocean, till within the last forty years frequenting the coast of Peru, by competent judges, has been estimated at 3,000,000; and that each one in the course of the night voids four ounces in weight. This number may appear exorbitant to those who do not consider that these birds have been left undisturbed, and in a regular state of propagation, ever since the creation of the world; and that, besides, they and their successive progeny have always found ample sustenance on the neighbouring deep. Taking the number here stated to be approximately correct, it would follow that the emanations of three classes only, deposited upon various points along a line of coast not exceeding 25 leagues, have amounted to more than 300 tons per night, independent of those of ten or twelve tribes of minor birds, equal at least in point of numbers to the families of the larger kinds, and whose voidances on an average may be set down at from one to two ounces each.

The faint idea here conveyed of the origin and quantity of birds' excrementitious deposits along the Peruvian coast, will enable those persons to correct their opinions, who, when this new fertilizer was first introduced, doubted whether these masses would supply a sufficiency to render guano an article of commercial interest for any length of time. Guano, in the Peruvian language, means dung, and Guanaes, the birds which produce it. So valuable were these contributors to rural prosperity considered by the ancient Peruvians, that, by special enactments, they were shielded from harm. In the breeding season, no one was allowed to land upon the islands, or visit the headlands, frequented by the dung-birds. Against those who killed them, the penalty of death was awarded; nor was it lawful to collect this manure at any other time than when the birds were absent from their roosting places. The heaps were apportioned out and allotted to the inhabitants of each district according to their wants, and any waste severely punished. The ancient Peruvians, however, principally used the fresh dung, taking away the deposits from year to year; a circumstance which leads us to think that the accumulations now ransacked by European traders, were left untouched by them. It is, indeed, presumable that formerly the fresh droppings afforded an adequate supply, and when collected, the whole was put into panniers, and on the backs of llama carried up into the mountains for distribution. The guano birds invariably roost upon the highest and most inaccessible ridges, frequently upon rocks overhanging the sea, and in these haunts nestle and produce their young. Huddled together on the same locality, in such a manner as scarcely to afford standing room, these animals leave their droppings, which, mixed with egg-shells and earthy impurities, are washed by the heavy rains occasionally falling into hollows below, where they form a bed, by time so much hardened as to require the aid of the pickaxe and blasting to break the strata. The masses in Peru, now working, vary from ten to thirty feet in depth, according to the situations, and bear evident signs of their gradual formation. Since traffic has become so general along the Peruvian coast, and the haunts of the guano birds have been assailed at unseasonable periods of the year, numbers of the frequenters have forsaken their old roosting places and sought out fresh ones, either on the north or south; but as the same agency goes on and never stands still, it naturally may be expected, that guano deposits will hereafter be found on other points.

With the aid of this manure, patient industry, and an economical plan of irrigation, the large population of ancient Peru, concentrated upon a confined space of cultivable land, was secured against the horrors of want. Their seed-lands were dug with a wooden spade, and divided into furrows, with a small beaten path between each, for the double purpose of receiving a current of water along it, and enabling the husbandman to avoid treading down the bed, as well as to weed it when requisite. Maize and millet were their principal grain, in sowing which they used the process of dibbling. A hole was made in the ground to a certain depth, and as much as could be rounded at the bottom, into which half a gill of dry guano was thrown and spread about. This basis was then covered with an inch of mould, and two seeds dropped in, and in case of there being no appearance of rain, care was taken to water the plot, an operation repeated every second or third day, for at least a month. On their stock of potatoes, however, the aborigines relied more than on maize and millet for their winter's food, and consequently they raised them in great abundance. For this purpose they also dibbled, and followed the same process as the one above described; but since the introduction of the plough, drills are used, at the bottom of which the guano is scattered, and mould thrown upon it, when the tubers are laid down and covered in. In the same way, the Peruvians planted the *oca*, yam, and other edible roots, with which their country abounded, always taking care that neither seed nor settings touched the guano, owing to its caustic nature. When ground had been thus prepared and sown, maize rose considerably higher than a man's stature, the stem thick and strong, with three and even four ears upon it, yielding from 400 to 500 for one. The produce of the potato was seldom less than 45 to 50 for one, and that of vegetables in the same or indeed in a higher proportion.

The increase in the *axi*, or Guinea pepper, was still more astonishing. Unaccompanied by this exciting condiment, the aborigines relished no food. Red peppers constituted the principal ingredients in all their meat and fish stews, as well as in their porridge, and were also eaten in a raw state with their maize cake. Being an article of the first necessity, they were in universal request, and an adequate quantity to meet the demand consequently became necessary. The Spaniards were astonished on beholding the numerous verdant patches of this sightly plant which ornamented the slopes, and at a distance appeared like so many hanging gardens. When the pepper seed was confided to the earth, a small calabash full of guano was placed underneath and covered with mould; the same quantity was repeated at the period of germination, and again when the fruit began to form. By this means they obtained upwards of 400 pods from each stem, which, when gathered, were hung up in the sun, and laid by as a winter store. With equal success was guano applied to flowers, shrubs, and fruit trees. By its application, cotton and plantain trees bore a double crop.

The Peruvians seemed practically sensible that, like other beings endowed with life, plants require a constant supply of food, and that this they can only obtain through the medium of the earth, the element in which they are destined to live and thrive. It therefore only remained to be ascertained, what food actually was the most suitable and congenial; and next, in what way it might be best administered; taking care, at the same time, to see that the nurslings were not injured by the application of matter containing any deleterious properties, equally fatal to vegetable as they are to animal life. Long experience taught them that guano is the most fitting *pabulum* or food for plants, the traditions of bygone ages having satisfactorily established the fact that nothing else afforded such an immediate, abundant, and permanent supply of nutritious matter. They did not stop to inquire into the causes of what, to them, must have appeared a phenomenon, neither did they pretend to know the chemical constituents of the soil to which their seeds and esculent roots were entrusted. They were satisfied with results obtained, seeking only how to apply the fertilizer, which Providence had laid in store for them, with judgment, and in such manner as to render it in the highest degree productive. Studying those distinctive principles which act in the development and growth of plants, they became convinced that their nourishment is derived from the soil, and taken in through the fibrous roots at the bottom of the stem, in their structure so extremely small and confined, that it became impossible for this nourishment to be imbibed unless within their reach, and in a soluble state. Hence the guano was always placed beneath the seed, seedling, or setting, with an intervening layer of mould, in order to guard against its caustic properties before it enters into a state of solution. The Peruvians took care to manure the plant rather than the land, applying water to the surface, in order that in the course of filtration it might, with the ingredient previously thrown in, form those combinations required by nature for the nutrition of plants. In this manner they increased the productiveness of the earth, as before stated, not only in reference to grain, edible roots, and vegetables, but also trees of a large size. On the principle that any animal becomes strong and robust when well fed and nourished from its earliest infancy, they occasionally guanoed their fruit trees, from the period they were first set until they attained a state of maturity. Hence nothing could exceed the size, beauty, and flavour of their native fruits.

After their establishment in Peru, the Spaniards continued the same system of agriculture, in practice found so suitable to the nature and circumstances of the soil, that it still continues in use, without the slightest improvement. Sensible of the importance of moisture, the ancient Peruvians had adopted judicious plans of irrigation, which proved their advancement, if not in the science, at least in the practice of hydraulics. By means of canals, aqueducts, and tunnels, they brought water from a great distance to a reservoir situated above their seed and potato lands, whence, by the aid of sluices and trenches, it was distributed down the slopes, at the bottom of which their fruit trees were planted, in order to economize the water which had oozed through the guanoed grounds. This practice still continues in full vigour, and a modern code of laws has been founded upon it, in order to prevent collisions between interested parties. When European grain, vegetables, and fruit trees were introduced, guano manure proved equally efficacious. Wheat and barley were sown upon lands which the year before bore maize and potatoes, yielding 300 bushels for one, and thus proving that there is a durable virtue in this fertilizer. Cabbages, peas, beans, lettuces, &c., were equally benefited by its application. Fig, olive, pomegranate, orange, and mulberry trees were also brought forward and rendered more productive; but in the vine and sugar-cane the effect was marvellous, and continues so to the present day. In the development of flowers, guano, when applied in the same manner, was found peculiarly serviceable, by its supplying those materials essential to the formation of their delicate tissues, and the elaboration of their beauteous colouring. Hence, on the banks of the Rimac, besides native flowers, the pink, rose, and jasmine have acquired a scent and brilliancy of colour which they cannot boast in Europe.

For nearly 300 years, as before stated, were these facts known to us; but nobody thought of availing himself of the information. Of the practice and results above stated, we had read in most of the early works on Peru, and saw them confirmed by the testimony of our own navigators, as well as by those sent to the Pacific by the French in the course of the last century; and yet this valuable food for plants remained entirely neglected. When Humboldt returned from South America, he brought with him samples of guano which were analyzed by chemists in Paris, and the results published with all due authority, but still no impression was thereby made in France, or any other part of Europe. In vain did the late Sir Joseph Banks, who accompanied Cook to the Pacific, and there learnt the importance attached to the use of guano, urge the adoption of this new manure upon the attention of British agriculturists; and in vain were his efforts afterwards seconded by another individual, who had more recently visited the western shores of South America. The first notice among us taken of this fertilizer was by General Beatson, an experienced agriculturist, who, in 1809, held the command of St. Helena. In 1816, this distinguished officer published his Tracts relative to that island, in which he acknowledges that his attention was first directed to guano by Sir Joseph Banks; and that, having a fair opportunity, he determined to try its efficacy, which he carefully did. He then proceeded to give the comparative results of his experiments with potatoes, using at the rate of 35 bushels of guano per acre, horse dung at 35 cart loads, and hogs' litter or stye dung in the same proportion. The result was that, on an equal space, the first yielded 639 lbs., the second 626 lbs., and the third 534 lbs., while no dung afforded only 446 lbs. To these results, he added in detail those of his experiments on grass lands, still more favourable in reference to birds' droppings.

These interesting particulars were read with indifference; or, in other words, no one in Europe dreamt that guano might be made available. A few *curiosos* connected with Peru procured a bag or two each, and in their own residences successfully tried it with flowers. When saline fertilizers came into fashion, owing to the scarcity of return cargoes in Peru, some of our merchants brought away the nitrate of soda, found in considerable abundance on small islands along the coast, but still its more valuable accompaniment continued to be entirely overlooked. Our merchants seemed to think that they should be disgraced by converting their vessels into dung-carts. At length, Messrs. Myers and Co., of Liverpool, had the courage to order over a small quantity on trial; and in 1840, twenty casks arrived, which were placed at the disposal of several distinguished agriculturists. Among the earliest experiments was that of Mr. Smith, of Gunton Park, Norfolk. He applied 200 lbs. of guano to an acre; and on an equal space in the same field, 15 bushels of bone-dust, when both were drilled into the ground with seed wheat. The result was, that the first plot yielded 6 qrs. 2 bushels, and 1½ peck, whereas the produce of the second was only 4½ quarters. Mr. Westear, of Burwood, Surrey, tried the same experiment with barley, and ascertained that five rods, prepared with guano, yielded at the rate of 59 bushels per acre, and with common dung 35. Mr. Harriott, N. Waltham, on the 1st of May, put a small quantity of pure guano into the ground with barley, after which it was noticed that the weather continued dry; nevertheless, the barley came up three days sooner than in other parts of the field, and was more luxuriant. The comparative produce was more than one-half, and double the quantity of straw. He also experimented on swedes, and found guano infinitely preferable to bone-dust mixed with ashes. Tried with clover, it produced, on the same space, half a ton more than in other sections of the field. Mr. Love, of Shoreham, also noticed a marked difference when applied to turnips. Messrs. Cormacks, florists, of Deptford, used guano for their plants, and recorded their testimony of its excellence. Mr. Nott, of Hallow, Worcestershire, acknowledged the beneficial effects of guano, when used for hops, as did his neighbour, Mr. Winnell. Other successful experiments were made in Scotland.

So highly encouraging were the results obtained in 1840, that the Liverpool merchants sent out orders to Peru for an increased supply, when the government declared guano to be a monopoly of their own, and levied a heavy duty on its shipment. Several British houses uniting, nevertheless, entered into a contract with the local authorities for a supply equal to 20,000 tons per year, on which they were compelled to pay royalty dues equivalent to the prime cost, which immediately advanced to 3*l*. per ton. In 1841, two cargoes reached Liverpool; and in the course of July in the same year, and at the dinner-meeting of the Royal Agricultural Society held there, Lord Stanley mentioned the subject, anticipating the results which might be expected from the importation of this foreign fertilizer. About the same time, the French Board of Agriculture and Science called the attention of the agriculturists in their country to the value of guano. In 1842, upwards of 20,000 tons were received in Liverpool and other ports from Peru, and first sold at 22*s.* to 28*s.* per cwt., then dropped to 14*s.* and 15*s.*, and afterwards to 12*s.* and 13*s.* This quantity served to dress upwards of 100,000 acres, and the farmers who used it rejoiced to find that guano brought their crops earlier to maturity, and besides increased them 20 or 30 per cent. It was then proved to be admirably well adapted for a damp soil and humid climate, and, as a manure, more durable than any other heretofore used.

The reputation of guano being thus established by a series of expensive experiments, (for it must be borne in mind that the duties and prime cost in Peru amounted to 6*l.* per ton, and the freight round Cape Horn, in many instances, to as much more,) the wits of our traders abroad were set to work, in order to discover other deposits where the same article might be procured on easier terms. At length, a small island called Ichaboe was found out, on the S.W. coast of Africa, containing guano in some hollows from 20 to 30 feet deep. This island is situated three miles from the mainland, and wears the appearance of a barren rock, without any vegetation upon it; but instead of these masses being formed by the excrementitious deposits of the birds usually frequenting the Pacific, they proved to be accumulated emanations from the penguin and seal, washed down by the rains. Notwithstanding the hurricanes which prevail upon this part of the African coast, the dangerous rocks surrounding the desert island alluded to, and the difficulties of loading, our vessels emulously flocked thither from almost every port, more especially Liverpool; and according to advices of October 3, received from Ichaboe, upwards of 300 British vessels were at that date lying there, loading and waiting for cargoes, and more arriving. The same letters add that, according to present appearances, there was no more guano left than would be required for the amount of shipping already there. It is estimated that in the course of the current year (1844) and the first six months in the next, as many as 350 vessels loaded with African guano will have arrived, independent of minor supplies from Peru. Taking the average stowage of each vessel to be 350 tons, it may therefore be confidently set down that, before the next six months expire, we shall have received upwards of 200,000 tons. African guano sells for 5*l.* 10*s.* to 6*l.* per ton; whereas Peruvian holds up at 10*l.*, a proof that the latter is most esteemed, which may be owing to its superior quality and its being less impure. It is known that, during the hurricane seasons on the African coast, the sand is blown off to a considerable distance out at sea, and consequently may have slightly overlaid the Ichaboe guano, the island being low, and entirely unsheltered. More phosphate of lime is also found mixed with it, which may be attributable to the penguin and seal dying upon the spot where they roost and breed, which does not always happen with the feathered tribes on the Pacific, whose dead carcasses are besides immediately picked up by the condor and other vultures daily descending from the Andes in search of prey.

Besides supplying the home demand, guano is now sent to Jamaica and Barbadoes, in order to invigorate the sugar plantations, exhausted by successive crops. It is asked for in Germany, and shipments have already been made to France for the vineyards, where the wine-growers have, at length, borrowed a lesson from the Peruvians. The importance of this article, therefore, continues to increase, both here and abroad, and apprehensions already begin to be entertained that, with the growing demand, the usual sources of supply will, in the course of a few years, be dried up. From the eagerness of our navigators it may, however, confidently be expected that other deposits will be found out in regions hitherto unexplored. Till within the last six years, bird-droppings have been considered of little or no value in Europe. Accumulations of them, however, are known to exist in Spain, in the elevated crags and caverns frequented by vultures, crows, and bats. The habitations of sea-gulls and other marine birds along our own northern shores, might equally be worth exploring. In the N. Pacific, guano deposits have already been visited; and already is this article shipped from the coast of Labrador to our American colonies. Numerous flocks of sea fowls, as well as large congregations of seals and penguins, have also been seen by navigators pursuing their course to the Arctic regions. Let their haunts then be searched. Guano, we are assured, was recently discovered in the turrets of Notre Dame, in Paris, and why shall it not be found in those of our own old churches? Professor Buckland, at a late scientific meeting, and while discoursing on spontaneous combustion, stated to his audience that two churches, the names of which he had in his possession, had been destroyed by fire through the accumulations of guano in the steeples and towers. The learned professor took occasion to remark that pigeons, crows, daws, and other birds were in the habit of congregating in the upper parts of our old churches, and that on visiting the venerable cathedral of Canterbury, he had himself counted fifty winged contributors flying through the broken lattices of the windows,—expressing his apprehension that, if their droppings were allowed to accumulate, and a strong wind during a thunder-storm should arise and cause a strong current of air to pass through the tower, that noble edifice might be destroyed by fire. If the danger of spontaneous combustion is not sufficient to induce those, who have charge of our old churches, to keep the steeples and towers clean, perhaps the price of guano hereafter will.

PHENOMENA PRODUCED BY THE JUXTA-POSITION OF CERTAIN COLOURS IN CERTAIN CIRCUMSTANCES.

TO THE EDITOR OF THE POLYTECHNIC REVIEW.

SIR,—I have just read, in the November number of your interesting Review, an account of the singular effect of the juxtaposition of certain colours, as brought before the British Association by Professor Wheatstone. For the benefit of those who are disposed to try the experiment mentioned, it were very desirable that the ingenious Professor would state the precise colours to which he alludes when speaking of red and blue; for under these vague denominations there are tints infinite. The precise colours for producing the best effect might easily be determined by saying the red of such an object, and the blue of such another object, in the animal, vegetable, or mineral kingdom, of course selecting those that are always of one constant tint: such terms of comparison are used in the nomenclature of colours by Werner and Syme. In the next place, we are desirous of knowing whether the colours, both of the ground and of the spots, should be dead or shining, and whether the substance of both should be the same; what sized spots, and what distance between them, succeeds best, and if the motion communicated to the whole should be slow or quick.

There seems to me but little doubt that the effect is due, as Professor Wheatstone thinks, to the impressions produced upon the retina by different colours, or rather, I should say, to the great effect produced by the red as contrasted with the effect produced by the blue. Every colour, no doubt, produces a different effect; but while I apprehend the blue to produce the least or the gentlest, and the red the greatest or most violent, the other colours may so nearly approximate in their effect, that the impression of the one may be almost immediately merged into that of the other. In the two experiments with red spots upon a blue ground and blue spots upon red, the cause of the phenomena is one and the same; at least, such is my persuasion. It is the effect of the red in both cases which remains even after the position of the object be so changed as to bring the one colour where the other was a moment before.

I made a very rough trial: I stuck common small red wafers over a piece of flax-flower blue paper; the latter was nine inches by six, the wafers about four lines in diameter, placed in quincunx order about an inch apart. It should be remembered, that what we denominate red wafers are in reality of an orange colour, or rather of a yellow scarlet. Having tried different distances from the light till I found the best suited to the effect, I perceived, upon agitating the paper, that the wafers had a very apparent motion, independent of that of the ground on which they were placed. I found also that by making the extent of the vibratory motion from side to side equal to the space between the wafers, they became alternately light and dark in colour, by the exact correspondence in one of the vibrations of the retained image and the new effect. In giving the paper a circular motion, the wafers seemed to revolve on their own axes without quitting the spot. A more extensive circular motion, if rapid, produced, as a matter of course, so many rings, which either touched each other at their circumferences or interlaced, according to the extent of the motion. I observed, also, that the effect of the dancing, so to call it, of the spots, is more readily perceived when these latter have been looked at for a little time before moving the paper. This, of course, is easily accounted for, by the retina having, by that means, time to receive the full impression. It certainly seems strange that black spots upon a white ground should have no effect. (I presume white spots upon a black ground were also tried.) I conceive, however, that this seeming anomaly may be explained by assuming that white, being the perfectly harmonious admixture of all colours, produces a kind of compensation of effects on the retina, which leaves it in a passive or normal state as regards the impression from any of the colours of the spectrum, and the passage from this normal state of the retina to the absence of all effect, when black is presented to the eye, may be so sudden and easy, as to leave no impression behind. We know, indeed, that nothing fatigues the eye so much as long contemplation of a white surface; but I much question whether a less prolonged presence of a bright red, by producing a more disturbing or abnormal effect, does not leave a more sensible and lasting impression than white would do under similar circumstances; and, if so, we may have the reason why black spots upon a white ground, or white spots upon a black ground, may not produce the effect experienced from red and blue. I cannot help thinking that the colours use dbeing complementary to each other has something to do with the phenomenon. When a black spot upon white is looked at for some time, and the black suddenly removed, its complement being white is not immediately perceived on the white ground, though after a time a white spot of greater brilliancy than the rest of the ground appears. In like manner, a white spot being placed on a black ground, and after a while suddenly removed, no effect is immediately apparent, but after a time a spot of intense blackness is perceived, by the side of which the black ground seems grey. Now from these facts it is evident, that in the rapid motion communicated to the white paper with black spots, in Professor Wheatstone's experiments, no effect from accidental colours can be seen; and no abnormal or violent disturbing effect having been produced on the retina by either black or white, there is no duration of the image, by which alone, in the case of red and blue, the tremulous motion of the spots can be accounted for. Red and blue, or rather orange and blue, are complementary; thus, when a red wafer is placed on a sheet of white paper, and after being for some time considered is suddenly removed, a blue spot, after a time, appears; this blue is that of the ground used in the experiment mentioned, and is therefore not seen to replace the removed red, because sufficient time is not allowed for the appearance of the brighter blue spot which would be seen to come where the red was, if the ground were not moved; but this does not explain why the image of the red remains. We can only account for it, as we have said, by the great, and probably sudden effect produced by the red, and which lasts some time after the cause which produced it has ceased to act; an effect which the blue has not the same power to counteract.

Having placed red wafers on a sheet of writing paper, I could not produce by backward and forward motion the same tremulous appearance of the spots as when they were placed upon the blue ground. If the motion in this case be very rapid, the spots become paler and are joined by a faint reddish line, being the impression left upon the retina by the passage of the spot over its surface. The immobility of the spots, in this case, would seem to shew that the effect produced by red is more readily counteracted by white than by blue, or in other words, that the retina returns with greater readiness to its normal state even after violent disturbance, than from an abnormal state of too great irritation, to an abnormal state of too little irritation.

But if I was unable to produce with red upon white the same appearance of independent motion as when the red was put upon blue, yet by giving to the white paper with the red spots a short and very rapid *circular* motion, each red spot seemed to turn upon its pivot with a rapidity far exceeding that communicated to the paper. Moreover the centres of the spots seemed dark and raised, while the rest was pale and flat. This apparent spinning motion is best observed when the eye is directed rather to one side of the spots, than when these are directly looked at; and, in like manner, when the tremulous motion of the red spots appears on the blue ground, it is most distinctly seen on those more removed from the direct axes of vision.

An effect somewhat analogous to the phenomenon we are considering, is produced by looking at certain striped cotton prints for dresses; when the stripes are chocolate-coloured or dark purple and white, narrow and equidistant, nothing scarcely is more painful or dazzling to the sight.

All these phenomena are extremely curious, and certainly difficult to explain, though I cannot but think that the effect of white light, so called, (I do not say unmodified light, because we are quite ignorant of such, as all light which reaches the eye is modified in some way or other by the media which transmit or the surfaces which reflect it,) is essentially different from the effect of any one of the prismatic colours, and that of these latter the red produces the most violent, and consequently the most lasting impression, while the blue produces the least and faintest. Perhaps the luminosity of the rays which strike the retina, independent of their colour, may have much to do with all these phenomena. After all, it remains to be explained, why the appearances mentioned by Professor Wheatstone are not sensible in any but artificial light; and this, we think, may be thus accounted for. The rays of the sun's light, owing to the immense distance of the illuminating source, impinge in parallel lines on the surfaces which receive them; independent of which, the light is greatly diffused by the atmosphere itself, and the countless reflections from surrounding bodies. Not so with artificial light; its source is proximate, and the rays fall consequently under a considerable angle on the bodies they illuminate. Artificial light is also weaker, and accordingly not so powerfully reflected as solar light; it is therefore less diffused, and its shadows darker. Now, whatever be the substances coloured red or blue in the experiment to which we allude, and however smooth they may be, they will have asperities, microscopic if you will, but colossal as compared with the tenuity of the rays of light. Each of these asperities, then, is a little mountain which, when illuminated by artificial light, receives the rays under a great angle on one side, while the other side has a dark shadow. Now it is clear that on moving this little surface of microscopic asperities, the same sides of them become alternately light and dark, and this transition' may be the cause why there is an appearance of motion in the spots when viewed by artificial light, which cannot be produced in the light of day. The sense of vision is but a modification of the sense of touch, and the phenomenon in question appears to me to be very analogous to that of the deceptive impression produced by rolling a small ball between the crossed fingers, when it is almost impossible not to believe there are two balls. It may be well to remark, before concluding these hasty lines, that phenomena readily seen by some persons do not become apparent to others for a long time, as is invariably the case with the accidental colours. We feel we have said very little towards a satisfactory explanation, though perhaps enough to call more attention to the subject, and we trust that Professor Wheatstone's inquiring mind will not rest satisfied with a fact casually observed, but that he will apply the resources of his fertile ingenuity to discover the rationale of the strange appearance which he has been the first to announce. I am, Sir, &c.,

J. R. J.

The Haswell Explosion, and Ventilation of Mines, &c. By JAMES MATHER, Honorary Secretary to the South Shields Committee for the Investigation of Accidents in Coal Mines, addressed to the Right Hon. Sir Robert Peel, Bart. A New Edition.

Review of the Report of Messrs. Lyell and Faraday, upon the subject of Explosions in Coal Mines. By MATTHIAS DUNN. London: Simpkin & Marshall.

THE first of these is a work of no ordinary merit and demands our warmest consideration, in regard to humanity as well as science. The subject is handled by a person who thoroughly understands the duty which he has voluntarily imposed upon himself. Mr. Mather, as the effective secretary of a society of gentlemen well known in the north of England for industry, patience, and perseverance, comes now forward and demonstrates that the dreadful accidents in coal mines are not only not abated since the report was published, but have lately been upon an increase to a frightful extent. This pamphlet proves that the highly gifted commissioners, Messrs. Faraday and Lyell, in their report have fallen into an error, in supposing that by tubing the goaves of the Northumberland and Durham coal mines, the danger of fire damp may thereby be prevented; that if these gentlemen had examined other collieries, they would never have recommended their plan, but, on the contrary, have testified the necessity of more shafts being sunk, especially to the goaves of the mines. Mr. Mather demonstrates that it is the duty of government to take up the subject, and not only to direct a strict search into the method of managing the coal mines, but also to appoint resident inspectors, who shall be answerable to government, and satisfy the community that their duty is performed in a suitable manner. It strikes us that the coroners' inquests have never been conducted as in other cases of loss of life, and that the colliers have much cause of complaint upon this point. Deodands are never levied in cases of accidents in coal mines, and in nine cases out of ten high compliments are bestowed upon the state of ventilation of such mines as have experienced these catastrophes and as in the case of the Haswell explosion, commendations were heaped upon the persons concerned in the management of that unfortunate colliery!

At whatever period a strict investigation shall take place, secrets will be disclosed which will astonish all humane men, ay, and men of science also.

To a superficial observer who may examine the downcast shaft and the upcast shaft, he will find that the current of ventilation is usually in a tolerable state, so that the the lights will shew that the air is not much contaminated, and that respiration will be carried on in a pretty free state; but let this observer descend into all the open spaces in the colliery, and he will find in many places that the air is nearly in a stagnant state. Should it so happen that from any cause a more rapid current shall sweep through those stagnant parts of the mine in which fire-damp is contained, whether in the goaves or amongst pillars, or in "bags of gas," as Buddle designated them, it will be found, as in the Haswell explosion, that the mixed gases being under such circumstances at the exploding point, the Davy lamp would not prevent an explosion taking place.

"More shafts! more air!" should be echoed through the whole length and breadth of the kingdom, as has been proved by this pamphlet, and that of the talented Matthias Dunn. Lamps of a superior construction to that of Sir H. Davy, as has been proved most amply, should be in immediate requisition in every part of the coal mines in the north of England. Let them be ever so well regulated, each coal-hewer should have his own safety-lamp, and be answerable not only that he uses it continually, but also that it shall be in good working order. It is hinted in this letter, as also in the South Shields report, that the Clanny lamp is far superior to all others, both as to safety and extent of light.

The tract entitled "Review of the Report of Messrs. Lyell and Faraday, upon the subject of Explosions in Coal Mines, by Matthias Dunn, Mining Engineer," is drawn up by a practical and scientific colliery viewer, as the title shows. From the last number of the "Polytechnic Review" it will be learned, that the first-named gentlemen were sent into the north by government to examine the Haswell Colliery, and to be present during the coroner's inquest that inquired into the causes of the explosion which took place at the above-mentioned colliery upon the 28th day of September last, by which ninety-five persons lost their lives.

The commissioners sent by government, in their Report, assume that they have discovered a method of managing fire-damp which has not been heretofore put into practice. This theory Mr. Dunn alleges is founded in error, and the proposed plan cannot be followed in the coal mines of the north of England.

The "Report" was promulgated in the month of November last, and as no person since that period has published any objection to the theory broached, (whatever opinions may have been privately entertained in respect to it,) Mr. Faraday has latterly felt so confident in the correctness of his views, that he delivered a lecture at the Royal Institution, illustrated by drawings and models of his contemplated plan.

The attempt, therefore, of Mr. Dunn to call in question so distinguished a philosopher might appear, at first sight, to be rash and hazardous for his own reputation; nevertheless, in the cause of truth and humanity, we feel assured that he has not been either the one or other. Mr. Dunn, in his introduction, hails with much satisfaction the proceedings of government in appointing the above-named gentlemen upon such an arduous duty, inasmuch as a dreadful waste of life and of property arises from a deficiency of requisite knowledge amongst those immediately concerned, and also amongst the community at large.

Upon the whole, Mr. Dunn does not approve of the plan suggested by Messrs. Lyell and Faraday for the prevention of accidents from fire-damp in coal mines, particularly in respect to the northern coal mines. It is worthy of remark, that these gentlemen have not heretofore examined any other coal mines, and, consequently, are not enabled to form correct ideas upon the subject.

It is to be regretted, that all classes of persons in the north have declined to follow the plan contemplated by these distinguished gentlemen. This is the more to be lamented, as much was expected to accrue to the cause of humanity by their investigation. What conclusion can any reasonable person therefore come to, but that common sense must indicate, that to government only belongs the basis of all investigations in respect to accidents in coal mines, taking care that the suggestions are carried out, and that partial views and superficial investigations are of no value whatever. It is not in the nature of things that any man, however learned or scientific, can be enabled to effect any thing of value except he be regularly educated for the duties of a viewer, and follow up practically and scientifically, in the bowels of the earth, his professional duties as a colliery viewer.

Mr. Dunn refers, at pages 6 and 7, to the theory of the commissioners, of piping off the fire-damp from the goaves of coal mines, which in the mines of the north of England, generally speaking, is quite impracticable; but in order to form a proper opinion of his ideas we will refer to the tract itself:—

"The ventilation of the goaf, or otherwise dealing with the gas generated within it, deservedly occupies much of these gentlemen's consideration; but, in handling this part of the subject, they appear to have commenced upon an erroneous impression, resulting from their pre-conceived and expressed opinion, that the Haswell Colliery was throughout the *ne plus ultra* of ventilation, and, therefore, they consider all similar ventilation must be inefficient. It is, therefore, material to review the nature and amount of ventilation which was applied to these goaves at Haswell.

"By recurring to the published account of the inquest, it will be seen that the principal air which was directed to that part of the workings where the fire occurred, was contained *in an area of a square foot;* and although an accession was received by means of the Meadows crossing, yet the united airs were straggled through the pillar workings, and thence entered the goaves at many different points, a very small proportion reaching the most distant parts where the accident was said to originate, as the learned gentlemen express it, 'there the ventilation was slow,' and, consequently, least efficient.

"Now the very expanded state of these workings having produced this admitted sluggishness of the ventilating current, was widely different from that of a goaf working outward from some artificial or real barriers of coal, from only one side of which the gas can discharge, and alongside of which a current of air is made to pass, consisting of many thousand cubic feet per minute, a column calculated to carry off the gas produced by the goaf without being adulterated to the firing point. Under these circumstances, practical men would pronounce such an arrangement, carried on with safety-lamps, free from the chance of explosion. 'But if the goaf is presumed not to make gas, and the current of air destined to ventilate such workings too greatly abridged, in order that a greater share may be devoted to other parts of the mine, then will the risk of explosion arise;' and were that even the case at Haswell, still it ought not to depreciate the principle of ventilation, as practised in the counties of Durham and Northumberland.

"The quantum of air required for the various parts of the mine, under the splitting system, also clearly involves the question, in respect to the number and capacity of the shafts, as compared with the area of the workings; because, if a fatal disproportion exist here, science would be exercised in vain.

"In allusion to that passage of the Report which, after describing the details of the pipe system, 'submits its principles to the consideration of practical men,' I take leave to observe that, in dealing with the subject (although the suggestion may be reconcileable to theoretic principles) they seem altogether to lose sight of the large area, and the great irregularity attendant upon the working of an extensive colliery.

"It is, therefore, not in the nature of things that the workings of an extensive colliery can be reduced into these theoretic rules. The intervention of faults, of different royalties, the necessity of water levels in fixed directions, and various other circumstances, cause workings often to be carried on at opposite extremities of the mine. Hence the call for numerous pipes to carry on such system; and it was from the deficiency of these very practical considerations that Mr. Ryan's suggestions were disapproved, because he suggested pipes theoretically, and upon the same scientific principles, without making allowances which practical men knew to be necessary. Hitherto the best principle of colliery management has been universally admitted to sink to the dip, prosecuting the workings to the rise, and then taking away the pillars in returning, thereby leaving the goaves behind, a great portion of which are, consequently, upon a higher level than the bottom of the shaft; whereas these gentlemen's principles would be to reverse this system, pulling both coals and water up hill by artificial, instead of letting them down by natural means.

"Thus much as against the suggested application upon a large and general scale; but there are other objections which, in my opinion, are equally fatal to the scheme, even upon a detailed principle—objections, the overlooking of which, no doubt, may be attributed to the want of that practical knowledge without which it is so difficult to deal scientifically with such a subject.

"The learned gentlemen assume, 'that the end of the pipe being securely raised towards the interior of the goaf, and the other end connected with the return air, that the gas will progressively be discharged along with the air, so as to prevent any material accumulation in the goaf.' Now assuming that the fractures and inaccessible vaults of the goaf are superior in altitude to the end of the pipe, it cannot naturally descend until completely filled; and in a goaf of many acres, of various altitudes, it has been shown that the theory would not be applicable, but that in any case many such pipes would be requisite, the cost of which would involve incalculable expense.

"Now as each pipe is presumed to be connected with the return or upcast shaft, by the shortest route, in order to compass the desired object of natural draft, it is well known to all practical persons that the surrounding air would rush with impetuosity towards the orifice of the pipes, and thus escaping to the upcast shaft, it would, as a matter of course, be lost to all the other workings. Thus the principal part of the air which ventilated the pillars in work at the position of the Haswell accident was, in attestation of this principle, compassed by an aperture in the scale doors of a *square foot area*—and if the orifice of a similarly sized pipe had been applied to these goaves, *all that air* would have gone directly to the upcast shaft, and been abstracted from the pit; whereas it was alleged to be useful in carrying off the gases of the goaf. Such objections, if good, would clearly apply to all the other pipes, assuming several to be necessary, so that the result would be to detract from the ventilating column, whilst it filled up the space in the upcast shaft. The necessity for numerous pipes has already been shown. Then as to the expense, assuming the pipe to be twelve inches diameter, every foot in length would weigh little short of a cwt., which, together with the joinings and labour, could not cost less than 20s. per yard—and a moderately extended colliery could not fail to require many thousand yards—so that *upon this ground the application may be deemed impracticable.*

"The piping of gas from certain parts of the mine is often practised; but the part from whence the gas is abstracted is always isolated, or partitioned off from the other workings, and nothing but gas is allowed to enter the pipe. Now this is utterly impracticable in the case of goaves, which by very constantly adding to, must necessarily be connected with the open workings, and cannot in that stage be separated: hence another difficulty of applying the suggested system.

"It may not be immaterial here to observe, that although the learned reporters have devoted much time and science to the method of dealing with the inflammable gases of the goaf, yet they have not made one single remark as to the curing of the evil of carbonic acid gas. Perhaps they are not aware that many coal mines, which produce no inflammable air whatever, are, nevertheless, greatly incommoded by the accumulation of carbonic acid gas in the hollows and goaves, especially in mines in which the working by long wall prevails. This gas is also much affected by the state of the weather; during frost and northerly winds, it has no tendency to exude from the hollows of the long wall; but during southerly winds, and sultry weather, it pours out in such abundance as to overpower a weak ventilation, and adulterate the air to such a degree, that a candle will not burn nor can a human being exist. Now this air is well known to be heavier than the ordinary atmosphere of the mine. *Query, would the piping system be applicable to it?* And does not the above fact also argue strongly against the application of long wall system in fiery collieries, inasmuch as the long wall goaf would as readily operate as a receptacle for fire-damp as for choke-damp, being acted upon by similar causes, and producing still more baneful effects in the adulteration of the air.

"I also think it necessary to notice another important practical defect in the Report, viz., the learned gentlemen have not prescribed at all for the cure of explosions arising out of *workings in the whole mine;* that is to say, the intersections of the field of coal preparatory to working any pillars, or the formation of goaves.

"The working of pillars in the deep and fiery collieries is but a very modern practice. The collieries in the Tyne district, viz., Wallsend, Willington, Percy Main, Hebburn, Jarrow, Bigges Main, &c., were laid out and prosecuted upon the principle that the working of pillars would be attended with so much hazard, and the expense of working with steel mills (then the only safeguard) so great, that these pillars must all be left. By degrees they were emboldened to take one-fourth; and it was not until the year 1815 or 1816 that the abstraction of the whole of the coal was thought practicable.

"Yet, during these periods, what numberless and fatal explosions took place! And in still more modern times, the collieries of Willington, Jarrow, Felling, Wallsend, Killingworth, and others, have experienced dreadful explosions, from workings altogether unconnected with goaves

"This fact is so consonant with reason, that a very few remarks will satisfy as to the truth. In the first place, then, during the opening out of a new mine, whilst the workings are few—the evolution of gas is naturally more copious, this process must, as a matter of course, endure for a length of time before pillar working can be commenced; and it is during this process that the safety of the mine is made to depend upon *an adequate ventilation, guided and guarded by stoppings, doors, brattices, &c.;* and as the gas thus evolved is also more pure and subtle than when mixed with other gases produced in the falling of the goaves in a travelled air, the neglect of a door, or other vital part of the system has been often the cause of calamitous explosions.

"Now to this important part of the subject the learned gentlemen have not once turned their attention; to apply pipes to the working *boards* of a coal mine would not, of course, enter their imagination. What then is to be done? The question may indeed be asked, what can be done, save *the effecting of a good ventilation applied by practical science, and carried out with adequate care and attention?*

"Let it not be imagined, then, that explosions are all, or even generally to be attributed to the goaf; the most calamitous have been known to originate in mines, the workings of which were very limited; and, as it has frequently happened, where the managers were so self-satisfied on the safety of the mine, that those preventives, which under other circumstances might have been applied were under this delusion neglected."

Having in the pamphlet enumerated the various points in which Mr. Dunn is of opinion that the commissioners have not comprehended the subject as to the cause of the explosion in the Haswell Colliery, he points out what he considers the best remedial measures calculated to amend the present system: he says,—

"Upon this subject much may be said. The Haswell evidence illustrated some remarkable and conflicting facts. First, that in certain parts of the mine the volume of air was superabundant; whereas the pillar working, where the accident occurred, was acted upon by a column of air, according to the expression of the Reporters, 'very slow,' and consequently least efficient. Now these expressions naturally involve the questions,—1st. Were all parts of the mine so supplied with air as to bear out safely the numerous splits which were taken from it? 2nd. If so, were those splits disposed after such a principle as to extend safety to the respective portions of the pit? 3rd. If they were so disposed with the greatest skill, but still ineffective in certain parts of the mine, then would it follow that the area of workings had become too extensive for the limited column of air adequately to ventilate the mine, although under the very best practice.

"These, then, are the grand points of the Haswell case, as leading to the theory of the learned Reporters, clearly showing that the principle of ventilation may be good, and the management bad—or that the management may be good, but the principle unequal to the accomplishment of the desired object. The commander of a troop of 1,000 men may exhibit the most undoubted bravery and skill; but if the obstacle to be overcome requires 5,000, probable failure is the consequence, and the fault then would rest with the commander who refused to allow a sufficient complement of men for the purpose—a case which clearly involves the question of limitation of area.

"If these observations apply to mines presumed to be governed by the greatest skill, and where nothing is wanting to ensure safety, how vastly different must it be in many mines under directly contrary circumstances? It may, therefore, be useful upon the present occasion to bring shortly under review the general principles of ventilation as variously practised, as well as other arrangements affecting the lives of the workmen, by way of exhibiting the deficiencies which exist, and of humbly submitting such remedial suggestions as may be brought into simple and immediate operation.

"I commence, therefore, by assuming that with regard to ventilation, to the fitting up of shafts, to the strength and quality of machinery, and to the various arrangements under ground and above, that the practice in the counties of Durham and Northumberland is superior to those of any other district that I have seen; and I submit that it is no proof of the inadequacy of the principle to instance the many and grievous accidents that from time to time have happened. These mines, for the most part, produce a greater discharge of gas than those of other districts, and as many of them are very deep, and very extensively worked, raising great quantities of coal, they have, as a matter of course, a greater number of people in one locality. Hence a reason for the greater loss of life in cases of general explosions. Whether and to what extent this *prima facie* fact be capable of being remedied will be noticed hereafter.

"The above deficiencies of system, as regards preservation from accidents, have been partially referred to, but may now be entered upon more at length, and it will perhaps be as well to put at their head, 'Accidents from fire-damp,' although they are shown by the statistical accounts to be by no means more productive of loss of life than other accumulated causes.

"The basis, then, of *good ventilation* is admitted to be *ample shafts and air-courses*, acted upon by a *rarefying furnace of adequate size placed at the bottom of the upcast shaft, or by some other more effective method.* Now in many districts of the country this simple and well-known safeguard is not practised; for either the air is left to circulate according to chance, or a small and ineffective rarefying lamp is employed; so that although the shafts be numerous, the quantum of gas immaterial, and the remedies simple, yet, owing to some cause or other, the system is not effectually carried on. The air current being in many cases necessarily weak, it is naturally ineffective, not only in carrying off the accumulations in the goaves, but also in the airing of the whole coal workings, the result of which is constant partial fires. To check such a current as this, sail-cloth curtains are much in use, which is attended with so great a loss of air, that before reaching the extremity of the workings there is scarcely any left; and under such circumstances, it is quite clear that the splitting system, so beneficially practised in this district, cannot be carried on there. Originating from the same cause is the impracticability of *bratticing* the working places, as practised in this district—and in lieu thereof the fan-blast is used, which is only effective so long as labour is applied; but during other times the gas accumulates and produces many unnecessary fires. In other collieries again, although possessing abundance of shaft accommodation, yet the airing is carried on by means of wooden boxes, 2½ or 3 feet area, the inefficiency of which must strike any reflecting person, and set at nought skill and science in the guidance of such a column. Another very prevalent oversight is the requiring the working colliers, as part and parcel of their bargain, to clear out and ventilate their working places, the owners having no responsible person to direct them, or to see it properly done—hence a very fruitful cause of accident arises. In the northern collieries, the overman or his assistants are required to visit every working place before the workmen be admitted, and it is their duty to see that all is safe before they commence.

"If great oversight exists with regard to the downcast and upcast shafts, it will not be wondered at that similar deficiencies prevail as to the dimensions of the various air-courses under ground, or of preventing the accumulating gases of goaves, &c., from being carried into the working parts of the mine, the natural consequence being to cause explosions either at the people's candles, or at the rarefying lamp at the bottom of the shaft. These, and innumerable other evil consequences result from a deficiency in the ventilating column.

"Many other causes of death arise from imperfect air-courses, the neglect of doors, the setting of timber, inefficient stoppings, and the employment of persons of insufficient skill. The deficiency of the latter often produces accident. The same may be said with regard to imperfect ropes, chains and the various gearing, the breaking or going wrong of which oftentimes causes the most disastrous results. I also consider that the letting system of contractorships operates disadvantageously; happily it is unknown in the extensive collieries of the north of England.

"If the above remarks be founded in fact, viz., an elucidation of the chief causes of accident, then it necessarily follows, that in many cases those precautions and safeguards which are universally acknowledged to be effective are neglected, and thereby loss of life occasioned. Again, in other collieries, although the best of known systems are enforced, yet, owing to the powers of ventilation being more limited than the extent of the workings demands, a column of air sufficiently powerful to ensure the safety of all parts of the workings cannot possibly be induced. Up to this period, the system of working mines never having been interfered with by the legislature, each proprietor has been allowed to follow his own plans, without any one being entitled to question whether any and what alteration of system would be beneficial, either with regard to the preservation of life or the saving of property. I think it cannot be questioned, that if government were to take up the subject all those principles would be reviewed, and that which would be found practically good would undoubtedly be urged upon those districts in which it is either unknown or unpractised, and thus imperceptibly a boon would be extended to humanity, whilst it brought about a national good. The deep mines of this part of the country could not be carried on at all if ventilation were conducted as it is in other districts."

We strongly recommend to our readers that they peruse this well-written and modest tract, which will well reward them for the trouble.

We regret that our limits do not permit us to follow with equal attention the letter addressed to Sir Robert Peel by Mr. Mather, whose position as Secretary of the South Shields Committee for the Investigation of Accidents in Mines, entitles him to a hearing upon points of such interest to a large portion of the community. We cannot, however, omit offering him our tribute of respect for the clear manner in which he has pointed out that explosions must continue to prevail whilst the present system of ventilating the mines is allowed to exist; and that the very mine of Haswell, notwithstanding its vaunted condition—certainly not worse, but better than many on the same field, is ready again to repeat the same blow, and to doom numberless victims to a merciless death, and scatter desolation in the bosoms of their helpless families. He has collected a statement of facts to demonstrate that the Davy lamp is a most dangerous instrument for mines.

MESMERISM.

TO THE EDITOR OF THE POLYTECHNIC REVIEW.

SIR,—Having heard that Dr. Montgomery Arnott, of this city, has been for five or six years an advocate of Mesmerism—which *he* calls Vital Magnetism—and, understanding that, having performed several remarkable cures, he was (under Providence) giving and restoring sight to the blind, I desired to investigate the subject. For that purpose I was introduced to Dr. Arnott on the 25th of this month. The facts I then witnessed appear so interesting, and seem to establish so unquestionably the truth and power of Mesmerism as a therapeutic agent, that, with Dr. A.'s permission, I send a plain statement for your perusal and subsequent publication in the Polytechnic Review. The two cases which came under my observation are only in progress of cure, and briefly are as follows:—

Miss Thew, a young lady between sixteen and seventeen years of age, is a native of Alnwick in Northumberland, and was born all but actually blind. At seven years old she could barely distinguish night from day, but since that period she could not perceive the brightest sunshine differ from the darkest night, until the 11th of October last. Dr. Arnott commenced to vitally magnetise her by manipulations on the 4th of that month; This was continued morning and evening for an hour and a half each sitting, *no other remedy being applied.* She subsequently perceived the light of a candle with the right eye only, which occurred after the sitting of the 11th. The same treatment alone was continued until the 16th, when she got sight in the left eye also, the right having made surprising progress during the interval. After this period, in addition to vital magnetism, Dr. Arnott experimented with electricity, mineral magnetism, and the fumes of hydrocyanic acid, each of which, he has reason to believe, accelerated the cure so far as it has gone. Miss Thew is now able to see her own features in a looking-glass, can distinguish the head-line of Chambers's Edinburgh Journal, and can trace with her finger the scroll heading the Scotsman newspaper. She can see people walking in the street from sixteen to twenty feet from her; and on the 12th instant, during a drive to Newhaven, on passing along George's Street, she observed from the carriage-window people walking on the pavement, and was able plainly to distinguish ladies from gentlemen; she also pointed out two dogs running along in an opposite direction to that which she was taking. In passing Inverleith Row she saw the evergreens before the doors, being the first trees she had beheld. At Newhaven stone pier she observed a fishing-boat between her and the sun when still at the distance of eighty yards at least, and asked what was the long dark object upright in it; she was told that one of the men was standing on the seat of the boat. When it came within a few feet of the pier, upon looking down, she distinctly saw the three men who constituted the crew. The dip and drip of the oar seemed to please her much. Her delight upon beholding the sea, the waves, and the light reflected from the water, was intense; she frequently exclaimed, "This is, indeed, a day in my life which I can never, *never* forget! there is nothing I longed so much to see as the great ocean; when I used to hear it while at sea-bathing quarters, from time to time, rippling and murmuring, dashing and roaring, how little did I think then that my wishes were so soon or ever to be gratified! Oh, what a difference I feel now, when compared with my former existence! Every day I get new ideas, that remain food for afterthought, and which I never could have had but for the blessing of sight." Miss Thew is an exceedingly interesting, apparently thoughtful, and accomplished girl. A lady who has heard her play on the piano and sing, and who is herself a proficient in music, informed me that her talent and acquirements in that charming science are far beyond what could be expected in one so young and labouring under the same bereavement. Her almost *total* want of sight at birth was said to have been from amaurosis. When Dr. Arnott undertook her cure she had large cataract in both eyes, with opacity of the cornea, especially in the left. This eye was much sunk; the coloured part of each organ of vision, as far as could be seen in consequence of cataract, looked like a transparent sack half filled with muddy water, receding, and quite soft to the touch. Her eyes are now firm and full, the one nearly as much so as the other. The cataract in both has disappeared, excepting a very minute portion close to the upper and inner edge of the iris. The right eye is a pretty, clear hazel, and the left, although not yet so translucid, will evidently soon be of the same colour and brightness.

The other patient of Dr. Arnott is a servant girl named Ellen Skelley, aged eighteen, who was introduced to his notice on the 2d of November last, by the Rev. H. Carr, Curate of Alnwick. Since childhood her sight was defective from chronic purulent inflammation of the eyes, and latterly her vision had all but gone from amaurosis and opacity of the cornea. The pupil is now of the natural size, the opacity has left one eye, and has almost entirely disappeared from the other. She has for several weeks been able to read a book at the usual distance from the organs of sight, and also to write, and to sew. Her treatment has been the same as that of Miss Thew.

As Dr. Arnott intends to publish the full details of both cases when their cure is completed, I shall offer no comment on the subject, and merely send the above rough notes, exactly as they were taken down—*currente calamo*—in his presence, in the hope that the facts which they communicate may be of service in establishing mesmeric truth.

I have the honour to be, Sir,
Your obedient, &c. &c.
M. G. S. C.

99, Prince's Street, Edinburgh,
January 26, 1845.

PASSAGE THROUGH EGYPT.

Project for transporting laden Merchant Vessels by Railroad across the Isthmus of Suez. By SIR WILLIAM CORNWALLIS HARRIS. Blackwood and Sons.

A RAPID and easy communication between the Mediterranean and the Red Sea has been, from an early period, a subject of the deepest interest to all nations engaged in commerce, and various have been the suggestions which from time to time have been made both by theoretical and practical men. A canal, a railway, have both had their warm advocates, and ample reasons have been assigned as well for the prosecution as the abandonment of such a design. We have now placed before us a letter addressed to the chairman and directors of the East India Company, by Sir William Cornwallis Harris, whose opinions are well worthy consideration, as well from the manner in which he has developed them in his address, as from his having the capability of forming those opinions. The rank he holds in the Bombay establishment of engineers, and the opportunities he has enjoyed as member of a special mission to the court of Shoa, in Southern Abyssinia, of becoming acquainted with the locality for which he has employed his pen, are guarantees that his views merit consideration. The proposal to draw merchant vessel across the Isthmus upon railroads would be startling to those who are not acquainted with the fact that it was at one time a subject of discussion amongst some merchants and manufacturers at Liverpool whether a vessel might be lifted from the docks on its arrival from America laden with cotton, the cargo transmitted to Manchester, have the raw article manufactured on board, and again sent back to the United States. The first blush of such a scheme was received, as is often the case with new ideas, with ridicule; and until the opinions of some leading men were given as to its practicability, the ingenious projector was treated as a wild visionary, and an unsound enthusiast.

After some sensible observations upon the difficulty he feels he has to encounter amongst the enemies of what are called innovation and novelty, and that his project is likely to be treated by them with contempt and ridicule, as a wild chimera, Sir William Harris observes that "a direct ship canal from the Red Sea to the Mediterranean, or a navigable passage from Suez to the Nile, are works that have been advocated with considerable tact, for the obvious purpose of creating a diversion from the only practicable scheme. But a railroad is at last unanimously admitted to be feasible, and the natural obstacles which were stoutly asserted to oppose its construction are proved to be imaginary. The line over which the rail must pass, far from being beset with difficulties to the engineer, has been ascertained to present a very favourable profile; and a hard gravelly soil is known to prevail in lieu of the shifting sands of the desert, which were skilfully conjured into existence by a faction whose theory was to arrest the progress of the trains. Those who had a purpose to serve in thus opposing the construction of a railroad are now compelled to admit that it could be made, and would fully answer the end of accelerating mails and passengers through Egypt; but they still cling to the scheme which dazzled the mind of Napoleon, and steadily maintain the necessity of piercing the Isthmus, so as to obtain uninterrupted water communication by means of a canal, which would enable merchant vessels of the largest class to perform the voyage between Asia and Europe *without discharging their cargoes*. It is not my intention here to enter into any renewal of the discussion respecting the practicability of this stupendous project, or the impediments that are in array against it; but, admitting to the fullest extent the advantages of its object, I shall endeavour simply to show, in as few words as possible, how that object may be accomplished at infinitely less expense, by a much less complicated process, and in a very much briefer space of time than by a canal.

"I propose to construct a class of narrow steam-vessels, of about 800 tons burden, suited for freight, and to transport them across the Isthmus of Suez upon trucks, by means of locomotive engines of adequate power. The vessels must be built upon the plan that will best serve to counteract any additional strain upon the sides involved by removal from the water, and the cradle truck upon which each will be placed during the transit must be constructed with the same view.

"The inaccessible character of the Mediterranean shore lying over against the Sea of Suez, and the general unfitness of all the ports or roadsteads on that coast for vessels of any considerable draught of water, clearly indicate the Nile, about

Cairo, as the most eligible point to which the railroad could be carried, in order that the laden steamers may be transferred from one to the other of the divided seas, through its always navigable channel.

" At the terminus on the Nile, and at the head of the Sea of Suez, an inclined plane must be run out, under suitable shelter, to a distance sufficient to admit of the steamers being readily hauled upon the rails. It might be carried into deep water at an inclination of one foot in forty or fifty, and a truck upon wheels sent down it so as to be brought beneath the floating vessel. This truck must be cradle-shaped, and so constructed as to receive the shoulders of the vessel, and thus afford her adequate support when she rides high and dry. By means of a stationary engine, both the vessel and the truck must then be drawn up the incline, so that the first sinking upon the second, will be raised upon the railway along which it was to travel.

" The locomotive engine required to draw a laden vessel of 800 tons burden across the desert of Suez, need not possess above three times the power ordinarily used upon an English railway; and the increased disposable breadth for the machinery will render this power one of easy acquisition. The masts of the vessel must be so constructed as to fold over and lie flat during the transit, in order to prevent any action of the wind upon them; and a moderate width between the rails will then be found sufficient. A station, to admit of vessels on their trucks passing each other midway, must be constructed in the centre of the line; and, as the entire distance of eighty-four miles could be accomplished in six hours, communication between Suez and Cairo might be daily held each way upon a single line of rails.

" Although constructed for steam-vessel trucks, these rails could be equally employed for the transit of mails, passengers, heavy baggage, and coals, by the adaptation of locomotive engines possessing only the ordinary power, with a train of carriages and trucks of the requisite breadth.

" The expense that would attend the construction of such a railroad, with inclined planes, stationary and locomotive engines, carriages and trucks, may be estimated within a million sterling. This sum falls very far short of the lowest estimate that has been framed for a ship canal, and it may appear a small sum for so long a line as that in contemplation; but it should be borne in mind, that the ground has not to be purchased, that there are neither bridges nor tunnels to construct, —both of which are among the heaviest items of an English railway—and that only one line of rails will be required. In every point of view the advantages are incontestible, of the scheme which renders the Isthmus a commercial thoroughfare, without the necessity of shifting the cargoes of the vessels employed. The railroad might be completed in two years;

whereas the construction of a canal, supposing it to be within the compass of human exertion, would occupy ten; and there is another highly important consideration to which I would direct attention, as one that is attainable by no other project. It is the entire supercession of quarantine. The rapidity of the transit through Egypt would set aside the necessity for this precaution; and the presence of a single *guardiano* would prove a sufficient guarantee that there had been no dangerous contact during the passage through Egypt.

* * * *

"Sailing vessels are so obviously unfitted for the navigation of the Red Sea, that, as a still further improvement on the scheme I have detailed, it would be very desirable, and I think quite practicable, to construct all the steamers employed as merchantmen upon such a principle as to do away with the necessity of locomotive engines to bring them across the Isthmus. They might be fitted with propelling screws in lieu of paddle-wheels; in the place of which latter might be substituted railway wheels, so that the vessel on its truck could work its way with its own engines. I am fully prepared to hear this idea sneered at as the very climax of absurdity, and scouted as a wild crotchet, little removed from the American proposal to 'hitch a locomotive to St. Peter's, in order to snake it across the desert of Sahara;' but our ancestors, too, would have indulged in a full share of mirth, had they been assured that their descendants of the next generation were to be whirled through the green fields of England, or transferred from Edinburgh to Glasgow, at the rate of forty statute miles within the hour. Men are to be found in abundance who, possessing no ideas of their own, hold themselves privileged to ridicule the conceptions of others; but as improvements in the process by which rapid locomotion is accomplished are also advancing at railroad speed, I deem it no absurd flight of fancy to conjecture that the period may be nigh at hand when, by the enterprise of man, the merchant steam-vessel, freighted with the produce of the East, after threading her way, in a single fortnight, through the intricate sea which the fleets of Solomon were twelve months in navigating, shall by a simple mechanical process be lifted upon the *chemin à fer*, and by the agency of her own engines transported across the disconnected link, and launched by the channel of the Nile into the waters of the Mediterranean."

IMPROVEMENT OF HARBOURS—HOLYHEAD AND PORTH-DYN-LLAEN.

The Report of the Commissioners on the Improvement of Harbours, though not officially put before the country, has appeared in some of the newspapers. It is an important document, and from the position and experience of the members who composed it, is entitled to mature consideration. It is at present, however, in the hands of the Admiralty Board, and until they render their report, it would perhaps be premature to enter into the details of the subject. Suffice it to say, that the Commissioners, adverting to the enormous outlay which France has for years been making upon the extension and improvement of her naval stations, and also looking to the necessity for increased harbours of refuge, recommend the adoption of very considerable works to strengthen and improve various points of our coast, particularly the southern and eastern portions of it—as Dover, Portland, and Seaford, which they place first in importance. The works for Dover alone are estimated at 2,500,000*l*., and Sir Robert Peel, who said a few words on the subject, in answer to a question, on February the 6th, seemed not disposed to enter upon so vast an outlay without due consideration. There was one harbour, however, which the Right Honourable Baronet said, he "thought it would be of great importance to improve," namely, Holyhead; and as from this intimation we think it probable that this project may be speedily brought forward, we feel it right to make some observations in regard to it. The subject is one of very great importance, not only as regards the facilities of transit and the opportunities of refuge to be obtained, but on account of the large outlay of money which must necessarily be incurred. And before this expense is decided on, it will be proper to inquire whether, both as a packet station and a harbour of refuge, a more eligible point of the coast may not be adopted than Holyhead. It is very true that a great deal of public money has been laid out upon this harbour and upon the Holyhead road, including the Menai Bridge, but the only question one has to consider now is, whether, under the new system of conveyance at present in use, a more direct and convenient line of communication between London and Dublin may not be made by adopting another point of the sea coast than Holyhead. And this brings us at once to the claims of Porth-dyn-llaen, a bay somewhat to the south of Holyhead, the advantages of which as a site both for a harbour of refuge and packet station have from time to time been much urged.

Before entering upon the detail of the subject, we may state by way of conciliating the attention of those who are averse to expensive novelties, that the estimates for the necessary works at Porth-dyn-llaen and Holyhead are considerably in favour of the former. With this premise we proceed to consider the eligibility of these two places, both as packet stations and harbours of refuge. In doing so we shall be largely indebted to the elaborate Reports of Sir John Rennie and Mr. Page to the Lords of the Treasury, recently published in Weale's Quarterly Papers on Engineering. We shall begin with the Report of Mr. Page, which is more comprehensive and popular in style than that of Sir John Rennie; we shall afterwards give the conclusions of the latter, whose opinion is of the highest authority and must carry great weight.

First, as a harbour of refuge. Mr. Page lays down certain principles which he considers should be adopted in forming a harbour of refuge, which we may briefly state to comprise—safety for vessels driving upon a lee shore; facilities by the nature of the coast for vessels to beach upon it; that it should be easy of access, particularly in that direction where, from the nature of the winds and tides, wrecks are most frequent; and, lastly, it should afford room for vessels to work out during contrary winds. Mr. Page then says: "It is evident that most of these conditions can only be fulfilled in a locality where nature has done much, and where art has to do little;" and proceeds upon this view of the matter to compare the capabilities of Holyhead and Porth-dyn-llaen.

We have only to look at the map to see that, as regards natural shelter, the latter harbour has every advantage over the former; independently of which, the Sailing Directions of the Admiralty show us, that whilst the approach to the former is narrow and obstructed by dangerous rocks, the latter is open and easy of access. The Admiralty Sailing Directions (1843) describe the bay of Porth-dyn-llaen as "clear throughout, with the exception of the rock called Carreg-y-Chwislen, which may be approached within fifty yards on all sides, is two cables in length from Porth-dyn-llaen Point, leaving a clear sound with five fathoms. The bottom is sand over clay, and the depth decreases gradually to the beach. In its present state the bay affords no shelter with the wind from W.N.W. to north, but for all other points of the compass it may be adopted as a convenient and safe anchorage." Moreover, whereas the whole coast in the neighbourhood of Holyhead is rock, which uncovers at low-water, there being no spot along the whole coast upon which a ship could beach with safety,—in the bay of Porth-dyn-llaen, as also in the adjoining bay of Nefyn, there is an extent of coast of 5,000 yards in length, in which a vessel may beach, the holding ground being sand over clay.

After going through these and other details, Mr. Page makes the following general observations: "Comparing from this accurate description of the two localities, and my own observations and inquiries, their natural capabilities in the most important features which may fit them for harbours of refuge, viz., the *holding ground*, which in one is a natural formation, clay to the surface, and which has enabled vessels to ride out tremendous gales, and in the other the probable result of drift, the *facility of beaching*, so extensive at Porth-dyn-llaen and so limited (if any can be assigned to it) at Holyhead,—the *shelter afforded* to vessels by the natural protection in each place, and the *strength and set of tides*, which are regular and gentle at Porth-dyn-llaen, and amount to a race in the neighbourhood of Holyhead,—I am decidedly of opinion that, for a harbour of refuge, the bay of Porth-dyn-llaen is preferable to the bay of Holyhead. In coming to this conclusion, I have considered all the objections which have been made to the bay, and am of opinion that some of the circumstances stated as objections afforded arguments in its favour; such, for instance, as the long ebb tide of nine hours, causing an in-draught into Carnarvon Bay, which tide, being an off-shore tide at Porth-dyn-llaen, is opposed to the prevailing winds, and would assist a vessel coming in at the east entrance. The tide, also, both ebb and flow, running through the sound, would maintain such depth of water in-shore as it might, for other purposes than those of a harbour of refuge, be desirable to maintain. Another advantage which Porth-dyn-llaen possesses, is the shelter afforded in all gales from the eastward on the west side of the point, where the Holyhead sailing packets have occasionally landed their mails and passengers when they could not get into Holyhead."

The plan of Mr. Walker for the improvement of Holyhead Harbour consists in extending the pier and building a breakwater, which will leave an entrance of about 300 feet in width, on its eastern side. Mr. Page states strong objections to this plan, and to pier-harbours in general. "The entrance to a refuge-harbour," he very truly observes, "should be made not so much for a ship fully rigged and well manned, like a ship of war, but with regard to the condition of a merchant vessel, with a thin crew harassed by fatigue, disabled in her rigging, and altogether ill calculated to steer very nicely into a pier-harbour;" and to this he appends the following note:—"So much is a pier-harbour generally dreaded, that in cases with which I am acquainted, a pilot who has been requested by the owner of a ship to run for Ramsgate Harbour, has given his opinion that he would sooner beach the vessel at Sandgate than run the risk of clearing the pier-head; yet to this harbour all ships pay a passing toll, the amount of which increases with the size of the ship; so that the ship contributing the greatest amount, can never enter the harbour to which she pays."

The plan which Mr. Page suggests for the formation of a harbour of refuge at Porth-dyn-llaen, consists in the establishment of a breakwater, which being of 5,600 feet would protect 400 acres varying in depth from twelve to thirty feet; or being extended in another direction to 8,650 feet, would inclose 960 acres; the sound, being left open, allowing easy access for vessels in that direction, and continuing an outlet for the sweep of the ebb tide round the bay without interruption. The most judicious course with regard to Holyhead, in the same gentleman's opinion, would be to inclose the bay between Ynys Gybi and the Clifera rocks by a strong breakwater, leaving two entrances of 800 feet in width; the area inclosed limited by soundings of twelve to thirty-eight feet, at low water, being 900 acres. The plan proposed by Mr. Walker, with a breakwater of 5,300 feet, will only inclose eighty acres.

The estimated expense of the proposed arrangements, with regard to either harbour, are as follow:—

			£.
Porth-dyn-llaen, to inclose	960 acres	. . .	1,021,000
„ „	400 acres	. . .	411,000
„ „	100 acres	. . .	200,000
Holyhead „	900 acres	. . .	1,872,000
Ditto and extension pier	80 acres	. . .	915,000

For practical purposes, however, we may restrict our attention to the third and fifth of the above estimates, which seem to be the plans generally considered as most eligible in regard to either harbour.

It is impossible to look at these estimates without coming to the conclusion that Porth-dyn-llaen is susceptible of being made into a spacious harbour at much less relative expense than Holyhead. We do not wish to press this fact for more than it is worth, but surely it is one entitled to consideration when Parliament is about to lay out money for this great national object.

We now come to the consideration of the probable advantages of either port as a packet station, which is a matter distinct in many respects from that of a harbour of refuge; the precision with which a steamer is managed rendering the narrow and difficult approach of a harbour a point of comparatively minor importance. The saving of time in the transit between the two extreme points of communication is here the great object to be held in view, and this, upon a regular series of daily transactions, must be determined by the average length of time of a series of passages. Upon this subject Mr. Page says:—"To enable me to express an opinion on this part of the subject, I have procured copies of the register of winds at Holyhead during the last three years, and have had them arranged with the force due to each on the points of the compass, showing the number of days on which each wind prevailed, and the mean force; the product of which may be used for expressing the effect of each wind upon the voyage." Mr. Page gives the table, upon which he adds, "In the period referred to, it will be seen that the result corroborates the generally received opinion, that the prevailing winds are considerably more in favour of the passage between Porth-dyn-llaen and Kingston, than between Holyhead and that port; that the beam winds are more than fifty per cent. in favour of this passage, and those against the ebb tide in a much higher ratio." Captain Beaufort, the hydrographer to the Admiralty, in his Report, dated November, 1836, explains this by this statement, that "the courses would be W.N.W. and E.S.E., so that the most prevalent wind (S.W.) would be a side wind both ways, an advantageous circumstance to steamers, as it enables them to steady themselves by canvass."

From a table of the duration of voyages of the mail-packets on several occasions, in the year 1841, between Holyhead and Kingston, they appear to have varied from 18 hours 45 minutes, to 5 hours 50 minutes; therefore, regularity of passage—a very great point in postal arrangements—cannot be pleaded in favour of Holyhead. The difference in actual space between the distances from Holyhead and Porth-dyn-llaen and Kingston Harbour, is estimated at about 6 miles in fine weather, and 3½ in rough weather in favour of Holyhead; but this, it is imagined, will be more than compensated by the regularity of progress which may be made between Porth-dyn-llaen and Holyhead.

We now turn to the masterly Report of Sir John Rennie, in which, after going into details, which coincide in every material point with the opinions of Mr. Page, he concludes with a general summary of the case.

After recapitulating the points of advantage and disadvantage in regard to Holyhead, which we need not repeat, Sir John Rennie states the advantages of Porth-dyn-llaen to be as follows, and he suggests no disadvantages to countervail them.

1. That it is two points further to windward than Holyhead, which, to use the expressive words of Captain Beaufort, "it is a fair wind both ways to and from Kingstown." This is particularly important, because it enables the passage to be made in equal, if not less, time than from Holyhead, although the distance is rather greater, during the stormy winter season, when it is most difficult to maintain the communication between the two countries; and as the passage to Ireland is of the most consequence, on account of the Ireland mails being dispatched from Dublin after the arrival of the London mail, whereas the dispatch of the country mails from London does not wait the arrival of the return mail from Ireland; thus a day would be saved.

2. The clear, well-defined outline of Port Dyllaew Bay, the conspicuous landmarks of the Rivals, Caer Bodfearn, and Madryn, the deep regular soundings, the absence of all rocks or shoals, or races, the excellent holding ground, the ample

space, all conspire to render the approach easy and certain, the departure equally so, because it is sufficiently prominent to enable vessels to work out when prudent to put to sea, and with the addition of another light would render it equally safe and certain at night. It is therefore extremely well adapted either for a packet station or refuge harbour, or both combined. It is said that the Mountains, the Rivals, and Caer Madryn, &c., are more frequently obscured by fogs than Holyhead: upon this Mr. Walker observes, "that fogs are prevalent off Holyhead is proved by the expedients adopted; an occasional lower light is exhibited at the South Stack, when the upper light is obscured, and in addition to the light at the pier; again, a bell and other means are used for guiding the packets to the entrance of Holyhead Harbour in thick weather. My conclusion, therefore, is," "continues Mr. Walker, "that the top of the Head is as frequently, or even more frequently, in fog, than the top of the Rivals." Mr. Walker also agrees that a refuge harbour here would be of considerable service, and save many vessels which now get embayed during strong westerly winds, when they cannot weather Holyhead.

3. The small expense, viz., 210,000*l.*, as stated by Mr. Walker, for 100 acres, which, even including 30,000*l.* for extra works, would make a saving of 679,325*l.*

4. Avoiding the necessity of making a new bridge across the Straits of Menai, at an expense of 200,000*l.*, besides creating a considerable delay of four or five years before the advantages of a perfect railway communication could be obtained.

5. By the adoption of Port Dyllaew, there would be a probability of an inland as well as a coast line of railway, which would be the means of giving the public the advantage of a double communication, which is of the greatest importance; and the public should not be deprived of such an opportunity without strong reasons, since it is only by establishing competing lines that the existing abuses can be effectually corrected, and the interests of the public best secured against the evils incident to monopoly; and in this view Mr. Walker concurred.

He concludes as follows:—

"Upon the whole, therefore, taking into consideration all the advantages and disadvantages of both places, and balancing them both carefully together, the question reduces itself to this simple form,—whether, for the sake of saving five miles in a sea voyage of sixty, which in moderate weather would make a saving of twenty minutes, but during gales of wind from the southward and westward, in winter, when it is most difficult to maintain the communication, a passage could be made in equal, or indeed in less time from Port Dyllaew, it is worth while, which *I consider very doubtful*, to sink an extra capital of nearly a million by adopting Holyhead."

There is another very important consideration to be taken into account in framing a portal communication, upon railway principles, between London and Dublin; upon which Sir John Rennie makes the following observations:—

"Having so far discussed the merits of the proposed stations for the packet station and harbour of refuge, the next question is to compare the two lines of railway; this a question which requires much more time than I have been able to devote to it. The inclinations of the line to Port Dyllaew, according to the plans now before the public, are certainly superior to those on the Holyhead line, although in an engineering point of view there is nothing objectionable in the former, with the exception of the crossing of the Straits of Menai, and here a formidable difficulty presents itself, both as regards time and cost. I quite agree with Mr. Walker, that the present suspension bridge is by no means adapted for a railway; and supposing it is, the public ought not to be deprived of it for the use of the ordinary traffic between the counties of Anglesea and Carnarvon. In order to conduct the railway traffic in a proper manner, a fixed bridge is absolutely necessary, and ought to be adopted. The late Mr. Rennie was always of opinion, that a permanent fixed bridge was the only fit means of communication across the Menai, and in his Report of the 16th of February, 1802, to the Right Honourable Charles Abbot, he enters into the whole subject with great detail and ability. For the reasons stated in the Report, he says that there are only two situations properly adapted for the construction of a bridge across the Straits, viz., the Ynys-y-Moch, and the Swilly Rocks 800 yards above it; and in this view the late Mr. Telford concurred. With reference, however, to carrying the railway across the Straits, some similar plan of a bridge (cast-iron) ought to be adopted; and taking into consideration the magnitude of the work and the difficulties of the situation, I do not think that it would be prudent to estimate the cost at a less sum than stated by Mr. Rennie, viz., 290,417*l.* The time, also for completing such a work, considering its extent and difficulty, and the numerous contingencies to which it would necessarily be exposed, could not be taken at less than from five to seven years."

Upon these statements, we think we have shown that the question between the comparative eligibility of Holyhead or Porth-dyn-llaen, either as a harbour of refuge or a packet station, is one well worthy of the attention and dispassionate consideration of the government and the legislature, when a large outlay of public money becomes involved in it.

PROJECTILE WEAPONS OF WAR AND EXPLOSIVE COMPOUNDS.

By J. Scoffern, M.D.

Lecturer on Chemistry, at the Aldersgate College of Medicine.

(Continued from p. 116.)

VARIETIES OF SMALL ARMS INDIVIDUALLY CONSIDERED.

Doubtless, the cannon soon after its discovery was occasionally reduced in size, so as to render it adapted for particular purposes; at length, after passing through many metamorphoses and gradations of diminution, it became a mere manual weapon of fire. It is impossible to say, then, when or where such small fire-arms were invented, but we pretty nearly know the period of their introduction to various European armies. " They appear to have been thus introduced into the English army in 1471. when Edward the Fourth, landing at Ravenspur in Yorkshire, brought with him, among other forces, 300 Flemings, armed with hand-guns. This is fifty years before the date usually assigned for their introduction; Mr. Anderson and other writers placing that event at the siege of Berwick in 1521, soon after which they were generally adopted in England."[a]

In 1555 the Spaniards, under Philip the Second, are said to have employed small fire-arms, but they were of a very unwieldy description. It had also always been considered difficult to protect archers against a resolute charge of cavalry, and the difficulty was greatly increased in the case of musketeers. The weapons and ammunition of an archer were light, his arrows flew in quick succession, and he was subject to no other cause of failure than the breaking of his bow or string.[b] Far different was it with the musketeer; his weapon was most unwieldy, exceedingly tiresome to charge and discharge, and subject continually to the chance of missing fire. Having fired their weapons, a host of musketeers were rendered for a time defenceless, and cavalry might pour down and put them to the rout; this was a sad disadvantage under which the musketeer laboured, and to overcome which various means were devised, the most common of which consisted in making the rest an arm of defence, appending to it a concealed dagger which flew out on touching a spring, or affixing a spike to the head. Rests thus armed were called the Swedish or swine's feathers.[a]

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[a] Wilkinson on Engines of War. See also Anderson's History of Commerce, vol. i. p. 351; Leland's Collectanea, vol. i. p. 721; Grose's History of the English Army, vol. i. p. 160.

[b] Hence it was not unusual to have two strings to the bow; and hence our common proverb. See Ascham's Toxophilus.

The greatest change which fire-arms have undergone relates to the method of discharging them. At first they had no lock whatever, but were discharged by the manual application of a match; then followed the matchlock, afterwards the wheel or pyrites lock, next the flintlock, and, lastly, the percussion-lock, under one of its many various forms; this seems to be the extreme limit of perfection, leaving nothing more to desire.

The matchlock was a very obvious and simple contrivance for dashing the lighted end of a piece of rope, soaked in nitre, upon gunpowder contained in a little pan communicating with the charge. This means of firing guns was on the whole very efficacious, and is still employed in most eastern nations. The match, however, is liable to be extinguished by rain, and is very dangerous to be carried in such close proximity with gunpowder, as it necessarily must. The ancient European musketeers used generally to carry their lighted match in a little iron cylinder perforated with holes, but in rainy weather they carried it in their hats.

The pyrites or wheel lock seems to have been introduced into England about the reign of Henry the Eighth. It continued in use until the time of Charles the Second, when the flintlock became general. This wheel-lock, now obsolete, but once universal in European armies, it may not be amiss to describe. The original idea of the contrivance may be recognised in an old *büchse* at Dresden, which has a piece of pyrites fixed opposite the touch-hole, which is intended to be rubbed with a file for the purpose of eliciting sparks to ignite the powder. In its improved form it consists of a small grooved steel wheel, to the axis of which a chain " or swivel and powerful spring is attached; this being wound up by means of a *spanner*, a key is retained in that position by a spring-catch connected with the trigger. A piece of pyrites is firmly screwed into the *cock-head*, which on being pulled forward rests on the circumference of the wheel, which enters the bottom of the pan. On pulling the trigger the wheel is disengaged, and spinning round in contact with the pyrites, it produces a stream of sparks close to the touch-hole."[b]

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[a] Grose, vol. i. p. 165. De Limière's History of Louis XIV. vol. vi. p. 88. Strutt's Manners and Customs, vol. viii. p. 91. Turner's Pallas Armata, p. 176.

For a comparison of the several merits of archery, and fire arms, consult *Humfrey Barwick's Discourse concerning the Force and Effect of all Manual Weapons of Fire.—Smythe* (Sir John, Kt.) *concerning the Force and Effect of Weapons.* Lond. 1590.—*Sir Roger Williams's Brief Discourse of Warre.* Lond. 1590, and the various treatises on archery already referred to.

[b] Wilkins.

Flintlocks appear to have been introduced into our armies about the third or fourth year of William the Third, (1692-3,) since which time they remained in use, with very little alteration, up to the period of the discovery of the percussion principle by the Rev. Mr. Forsyth. It is quite unnecessary to describe a contrivance so well known as the common flintlock; just as unnecessary is it to describe the common percussion-lock of the present day,[a] although it has undergone many changes of form since the discovery of Forsyth. Suffice it to say, that the advantages of the percussion over the flint principle are now universally established, and muskets of this construction are either already introduced, or about to be introduced, into every European army.

We have hitherto designated small arms, in contradistinction to artillery, by the general term *musket;* this, however, was merely for the sake of convenience; various are the appellations that have been given to manual fire-arms, some of which we will proceed to describe. The first small fire-arms were called hand-cannons, and were fired on a rest by the manual application of a match. When the weight of these instruments was reduced, and a lock appended, so that they might be fired without a rest, they were called *calivers.*

It is supposed that the most ancient kind of fire arms mounted upon a stock was the *arquebuse*, and the invention of it is placed about the year 1500. These instruments succeeded the hand-cannons, or culverins, in field service, and restricted the use of the latter to sieges. Such hand-cannons were afterwards called *arquebusque à croc,* (arquebus, with hook) in consequence of being provided with an appendage of that kind. In our statutes it was called "arquebuse," "haquebus," and "hagbut."[b] The term *musket* was originally applied to a fire-arm larger and heavier than the caliver, and therefore supported when fired by a rest. The *petrinal*, or *poitrinal*, was an arm shorter than the others mentioned, and of larger calibre; it was fired resting against the breast, and hence its name.

Pistols are so called from Pistoia in Etruria, where they were manufactured anterior to 1544, in the reign of Francis the First. The German horsemen called *reiters* were the first who extensively employed the pistol, having discarded, in favour of this weapon, the long-used lance, and incurred for that reason much censure, and even abuse, the innovation being considered to some degree dishonourable, and opposed to the established laws of chivalry.

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[a] It may be as well to state that the powder originally used for charging percussion caps was a mixture of chlorate of potash and sulphur. This was, however, found to destroy or corrode the lock, and now the *anti-corrosive powder*, or mixture of fulminate of mercury, is universally employed.

[b] There appears to be no just ground for considering the harquebuss and caliver as different weapons. "It is supposed by many," (says Barwick, p. 8,) "that the weapon called commonly a caliver, is another thing than a harquebuze, whereas in troath it is not but onely a harquebuze, sauing that it is of a greater circuite or bullet, than the other is of, wherefore the Frenchman doeth call it a *peece de calibre*, which is as much as to say, a peece of bigger circuite."

Anciently, not only were fire-arms large and small used to project bullets, but wooden arrows, called *sprites*, and steel quarrels were also employed.[a] The recent musket is so obviously the derivative from the ancient small fire-arms, that all description of its nature and construction will be unnecessary. The rifle-gun, however, differs from all other fire-arms in a very important particular, which we must now describe. Owing to a variety of causes, bullets from common barrels fly very wide of their mark. In the first place they are seldom correctly cast, or if so originally, they soon become imperfect from wear and pressure, hence the air re-acts on them very unequally and deflects them from their intended course. Again, not touching equally every side of the barrel, they are subject to another great cause of irregularity. The rifle-gun counteracts these injurious tendencies by imparting to the ball a spinning motion on the axis of its line of flight, and thus presents every part of the ball (except the two axes) in the same direction successively; thus any natural imperfection in the ball is compensated for, whilst, owing to its fitting the barrel closely, it touches every part alike. This peculiar spinning motion is imparted to the ball by very obvious means. The interior of a rifled barrel is cut in spiral grooves,—in point of fact it is a screw, into the furrows of which a leaden ball is either indented or cast originally to fit; thus it cannot be projected straight out, but emerges spirally, which motion is continued throughout its course. Hence a rifle ball is projected with far greater accuracy than a ball from a common gun, but it is not, as some suppose, urged further;—indeed, not so far.

The Bayonet.—This weapon seems so plainly indicated as an addition to the musket, and is so simple, that our wonder is at first excited at its application having been delayed until a comparatively late period. Not much reflection, however, is required to show that until the weight of the first small fire-arms had been considerably diminished, the bayonet, even in its present improved form, would have been a useless appendix. The idea of the bayonet originated in the practice which once prevailed of thrusting the handle of a short dagger into the muzzle of a gun after its discharge; thus it might be made to act as a pike. Such bayonets[b] or daggers as these were, according to Père Daniel, introduced into France about 1671.

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[a] See Sir Richard Hawkins's account of his voyage to the South Sea, A.D. 1591, p. 164, sect. xvi, where he mentions shooting arrows from muskets with great success.

[b] So called from having been originally manufactured at Bayonne.

The present mode of fixing the bayonet was a late discovery, having first been applied by Marshal Catinat in 1693, at the battle of Marsaglia, on which occasion the slaughter was immense. Notwithstanding this success, it was not until two other great victories had been achieved by them, namely, the battle of Spires in 1703, and that of Calcinata in 1705, that they were adopted by other nations. The introduction of this weapon led to the disuse of the pike, which was abolished by royal ordinance in France, in 1703, with the advice of Marshal de Vauban. We do not know the exact period when pikes were laid aside in England, but we believe about the same time.

When small fire-arms were first introduced, those who bore them seem to have carried their ammunition and charged their pieces just as pleased themselves. Some used cartridges, some flasks, and all were under the necessity of employing for priming, mealed powder, then called touch, tutch, or serpentine powder. As for the ancient method of charging small fire-arms, an old writer intimates that all *good* musketeers, caliverers, &c., thrust in paper, or something equivalent, between powder and ball, but more particularly on the ball. He attributes a frequent failure of shots to the circumstance that, for want of paper thus thrust down upon the ball, the latter frequently rolled out.[a] We learn, then, from this, that the practice was any thing but universal, and we may judge how ineffective must have been the shooting. In the reigns of James and Charles the First, was introduced an appendage for facilitating the charging of muskets, called the bandalier. It was a broad belt thrown over the left shoulder, and hanging down on the right side. This not only served as a support to the fire-arms, but had suspended from it about a dozen boxes, each of which contained one charge of powder, and also a bag for balls. The bandalier, however, was both cumbersome and dangerous; often would its boxes get entangled; not unfrequently they would ignite and explode; while their rattling against each other often betrayed the soldier to the enemy.

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[a] It may not be uninteresting to present the reader with a quotation from William's Discourses of Warre, descriptive of the management of ancient small fire arms. "But here it may be demanded what I doo call the well charging of pieces of weapons of fire? Whereunto I answer that I doo allow neither harquebuze nor mosquet for well charged in services of the fielde, unless they bee charged with conuenient charges of powder, and with soft browne paper, or the refuge endes of matches, or something else to restraine the same, and likewise vppon the bullet the like or more quantitie to keep close, and restraine the bullet: or when at the least I would that some such thing should be thrust upon the bullet with the skowering stick, to keep the same close to the powder." Then he proceeds to advise that the bullets should not be too small, but should fit the barrel exactly, p. 136-7.

ON NOVEL APPLIANCES OF WAR, PROPOSED OR EXECUTED, SO FAR AS RELATES TO PROJECTILES.

Having attended to most of the circumstances which limit the range of projectiles, we purpose now to state, as shortly as is consistent with truth and justice to the subject, the means which have been proposed to increase this range; we will also mention the results of these suggestions, so far as they have been carried into practice, and will discuss the probability of the existence of methods said to be kept secret, and the chance of the discovery of others.

We have already alluded to the common supposition that chemical science may present the artilleryman with some substance that is, in common parlance, "stronger" than gunpowder, and that by this means a vast increase of range may be effected. We have shown the futility of this opinion; we have proved that chemists disclaim any such knowledge; we have demonstrated that if they should claim to be the depositaries of such a secret, the mathematician and practical artilleryman would treat the statement with unbelief, and justly too, because it is in opposition to incontrovertible laws. As well might a chemist say that he could annihilate the attraction of gravitation, as that he could elaborate such a peculiar composition or gunpowder.

It may be said that chemistry is a field whose treasures are but little known; that although such explosive compounds as chemists generally are aware of may be inferior in propulsive force to gunpowder, this mere fact is not sufficient in itself to warrant a supposition that some peculiar composition of exceeding potency may not be discovered and held in secresy by one favoured individual; still *our* objection applies not the less. There is a point beyond which no increase of primary force can increase the range of a projectile, *and this point is far within the limits which circumscribe the force of gunpowder.*

We are justified in asserting, then, that far advanced as are all sciences connected with military engineering, in the present day, very little increase of the range of common ordnance (we mean cannons and engines of that class) will be effected; and that this little will be accomplished, not through any new composition of gunpowder, but as a consequence of improvement in the mechanical construction of missiles, and their projecting ordnance.

The longest range and greatest velocity ever accomplished by any ordnance, ancient or modern, up to the period of 1840, and we believe to the present time, is 5,720 yards, or just three miles and a quarter. The whole time of flight was only thirty seconds and a quarter, which is estimated at 2,100 feet, in the first second of time. The piece of ordnance used on this occasion was a fifty-six-pounder cannon, cast on the principles of Mr. Monk, who suggested the propriety of removing a considerable proportion of useless metal from the gun before the trunions, and adding it to the breech, where alone increased strength is desirable. This arrangement permits the use of a larger projecting charge of gunpowder, without risking the calamity of bursting. The quantity of powder employed in the experiment alluded to was ten pounds, and *the ball weighed sixty-two pounds and a half*, a circumstance which requires some explanation, seeing that we have stated the gun to be a fifty-eight-pounder. The explanation is this: the momentum of a projectile is the product of its mass and its velocity; by increasing that mass, therefore, or, in other words, by adding to its weight without adding to its size, we acquire a proportionate increase of momentum, and a consequent increase of range. The shot on the present occasion was an iron shell filled with lead; hence its weight of sixty-two pounds and a half.

Nearly the same range was accomplished by the French during the Peninsular war, who threw shells into Cadiz, rather more than a distance of three miles; they, however, used enormous mortars, one of which is at present in St. James's Park, and employed the largest charges of gunpowder ever known in modern times; the missiles projected, moreover, were shells *nearly* filled with lead, the remaining space containing gunpowder ignitible by a fuse as in the common shell.

The fact that leaden balls accomplish a longer range than iron ones, seems to have been discovered, at least *once* by chance, the discoverers being totally ignorant of the principles on which the circumstance was founded. It is related that during the war an American ship having expended all her cannon-balls, and being unable to procure others of a similar kind, had some prepared of lead; when on employing them in a subsequent action, her captain and crew were surprised at their long range and efficacy. Sir Howard Douglas is so satisfied of their advantages on peculiar occasions, that he recommends their introduction in the navy.[a]

Amongst the suggestions which naturally present themselves for increasing the range of a shot, a very obvious one seems to be the diminution of its windage, or the space which exists between it and the inside of the gun. Thus is reduced to a minimum the loss experienced by the escape of the gunpowder around the sides of the ball. That short kind of ordnance, the carronade, is made to embrace this amongst other principles, and the result of practice fully warrants, in this case, the justice of the theory. To long guns, however, the rule does not apply, —a fact which may seem strange at first, but which can be easily explained. With very great velocities and long guns there is a large column of air to be displaced before the ball leaves the gun, and which is condensed with great rapidity by the force of the ball, to which it offers immense resistance if it fit the gun closely. If, however, the size of the ball be reduced, the air has more space to rush round it, and the ball more easily escapes.

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[a] Naval Gunnery, p. 60.

Believing as we do that no considerable increase of range, from guns of the sizes at present in use, will ever be acquired, the question still remains unanswered whether such increased range may not be achieved by other means. For the sake of precision, we will assume this increased range to be six miles, and will ask whether such can be accomplished by any method, or combination of methods? We do not regard it as totally impossible;—we see no primary law of nature against it, although we recognise difficulties so grave, and so numerous, as to check even the wild excursions of our fancy; and we are not theoretical enough to forget that even the mere possibility of this range granted, its military application is quite another thing;—involving considerations of facility, expense, and amount of scientific acquirement; besides a thousand and one others, all separate from the original question. As to the *possibility* of such a range, stripped of all accessory and contingent difficulties, our opinion is in the affirmative, although we are aware that the investigation of others, more practically conversant with these matters than ourselves, does not lead them to a similar conclusion. If a cannon-ball, when its flight was nearly expended, could meet with some aërial gun to urge it forward again,—if, in other words, its flight could be made to depend on two or more consecutive impulses, instead of one primary shock, its range would be evidently increased. Now, in reality, these desiderata are to a great extent accomplished by the rocket, which carries its own propelling agent with it. The question, whether a cannon-ball, of the largest present size, can be shot six miles, involves a primary law of nature,—a law which must be suspended before the question can be answered in the affirmative, and which consequently is an impossibility. The question, whether a rocket can accomplish this distance, involves no such suspension of a natural law, and no such impossibility. The rocket presents us with certain theoretical conditions necessary for the end in view; it remains to ascertain whether they can be sufficiently elaborated.

But in thus ideally suggesting a probable range of six miles, we need not assume the necessity of any increase of range either of gun or rocket. We will suppose a missile to be formed of a combination of one ball and two or more rockets; this missile first to be projected from a gun, during which a fuse is to be ignited, and to burn during its trajectory course, in such a manner as to ignite the first rocket. This rocket is now to free itself from the ball, which falls; the rocket proceeding in its course, and eventually igniting the other rocket; this last accomplishes the termination of the distance.

All this may be assumed as possible, although involving thousands of difficulties to which we do not require to have our attention drawn. We know the irregular flight of rockets,—we know the difficulty which their sticks would occasion when thus shot from ordnance,—in short, we are not visionary nor sanguine on the subject, and could fill half a dozen pages with difficulties and objections to the scheme,—yet we see no reason why it *must* be regarded as impossible. Our ideas as to the precision of flight of such a missile would be *very* moderate. For our own part, if we rejoiced in a size a thousand times greater than our present dimensions,—if we out-rivalled in stature the Cyclopes of old,—we would willingly, for the tenth part of three hundred thousand pounds, expose our vast bulk in any aspect the operater might most desire, for the long space of three months, and at four miles distance, as a target for such a weapon. We would stipulate, however, that we should be distinctly and accurately aimed at; conceiving, like a certain spaniel who always posted himself exactly opposite the muzzle of his master's gun, that the charge was more likely to take any other direction than the one desired.

The attention of the public was a short time ago on the *qui vive* about long ranges, being directed to this subject in consequence of the circumstances disclosed by Mr. Warner, who probably had in view the very plan of accomplishing a six-mile range that we have already mentioned, inasmuch as he asserted that a two-pounder gun made on a peculiar construction would be sufficient to accomplish it. Now, we well know, that, *cæteris paribus*, the longest range will be accomplished by the largest gun, and that a two-pounder cannon is smaller than any in our service; without intending any disrespect to any one, then, we may safely assert that to project a ball six miles from a two-pounder by the mere primary force of gunpowder is a physical impossibility; and that if such range be accomplished, and a two-pounder cannon be instrumental in accomplishing it, this can only be effected by some such plan as we have described. We have another reason for presuming Mr. Warner to have intended this to be the plan,—he disclaims most pointedly ever having asserted that he could project by means of a two-pounder *a cannon-ball* six miles; but he avoids stating that the two-pounder is not to be instrumental in projecting a missile of name unknown to that distance, and he requires a two-pounder peculiarly constructed.

We here leave this part of the subject, and proceed to the consideration of some other improvements which have either been introduced or are proposed to be introduced to the warlike art. The mere projection of missiles by the force of gunpowder was a great discovery; the application of the same substance to the bursting of shells was an ingenious and useful extension of it, adding to the mere projectile force of the ball the devastation and the consequent terror of fire, together with the primary explosive power and disintegrating influence of gunpowder. When first shells were thrown from mortars, pyrotechnical science was not sufficiently advanced to render the period of their bursting at all certain; neither were the principles or practice of their firing well known. They were ill-constructed, ill-managed, and moreover a prejudice existed that the fuse must be lighted before the charge was fired, which added considerably to the danger as well as the trouble of mortar practice. These defects are now, to a great extent, overcome; shells are cast of equal weight, and their fuses correspond so well amongst themselves as regards time of burning, that the distance of projection being known, the time of bursting can be calculated with wonderful accuracy. When, however, it is considered that a small fraction of a second is on some occasions a matter of considerable importance, and that such an amount of accuracy is hardly possible to be expected from the use of the fuse, it will be evident that any simple and at the same time safe and effective plan of procuring the explosion altogether independently of the fuse, would be a desideratum. The various substances known to chemists as capable of exploding by percussion, favours the idea of a substitute. Could not a shell be filled with gunpowder, as is usually done, and furnished in some manner with an appendage, such as the copper percussion cap for instance, which might explode when the shell struck the object, and thus ignite the contained charge? Instead of a shell furnished with a percussive appendage, could not the percussive material form part of the shell? These are amongst the most obvious questions which present themselves, and at a first blush they seem easily answerable in the affirmative; but a little consideration will develop many difficulties. There is no difficulty experienced in making a shell explode on percussion, but it is exceedingly difficult to make it explode when wanted. The primary impulse of the charge of the gun is in itself a strong percussive agent, and hence percussive shells as frequently explode immediately on leaving the gun as on striking their object. This is a very great disadvantage, although certainly not insuperable; a far greater one is the difficulty and danger of keeping such shells and conveying them from place to place, not under peculiar scientific charge, but subject to all the shakings, blows, and other contingencies of military and naval transport. This remark certainly does not apply to those shells which are furnished with a percussive appendage, but they are open to other grave objections. In a shell of this kind some provision must be made to insure the striking of that part of the shell which is furnished with the percussive appendage,—a matter in itself of no small difficulty as regards cannon, and which as yet has only been accomplished by departing from the spherical and assuming the pyriform shape in the construction of the shell, under which circumstances the large end will point forward, and consequently strike the object first. Now, the united testimony of practical men is against the employment of non-spherical missiles, so far as relates to every variety of gun, and at long ranges, as being so exceedingly irregular in their flight that their use becomes most uncertain, and defies all calculation. At short distances, however, and especially for sea-service, bar shots are, under particular circumstances, recommended. A small gun may thus be made to project great weight of metal, and thus to acquire a great increase of destructive power.

The remark only applies to cannon, and plain small arms: so far as relates to rifles, the difficulty has been entirely overcome,—or more correctly speaking never existed. An elongated or cylindrical body, properly fitted to the rifle and shot from it, maintains during flight that end forward which first emerged from the barrel, the reason of which is attributable to the rotatory motion it acquires. If then a hollow cylinder of lead, fitted to a rifled barrel, be filled with gunpowder and furnished with a copper percussion cap, or some equivalent contrivance, it will act very efficiently as a percussion shell. Captain Norton has availed himself of the principle, and in allusion to the contrivance, Mr. Wilkinson of Pall Mall, in his work on engines of war, p. 115, states,—"I never found one (*i. e.* of these shells) fail to strike on the foremost end, and explode at all distances from 50 to 300 yards. In one experiment I fired at two thicknesses of inch and half elm lined with sheet iron, and containing between them a stratum of four inches of water, the shell passed through the whole at sixty yards distance, and exploded a box of gunpowder on the other side." It will be seen then, that so far as relates to rifled small arms, there is no difficulty,—but rifled cannon do not exist, every attempt to use such ordnance effectively having proved a failure.

Mr. Pasley, many years since, proposed a very safe and ingenious plan for making a percussion shell, the explosion of which was dependent on the fact, that air suddenly compressed liberates heat sufficient to inflame gunpowder. His shells were pyriform, for reasons already mentioned, and a cylindrical cavity terminating at the large extremity of the shell, was partly filled with gunpowder, and closed with a tightly fitting iron bar, which projected considerably beyond the surface of the shell, but which a sudden blow could force down after the manner of a piston, and thus ignite the powder. These shells were tried at Woolwich, and condemned chiefly on account of their departure from the spherical form; although it would not be difficult to point out other disadvantages. For instance, the quantity of gunpowder such a shell could hold, would be very insignificant, and the bar would be very liable to get fixed from rust, &c.

We have hitherto supposed that the shell is to be filled with gunpowder, and that a percussive explosive substance, is to be merely an agent for igniting this gunpowder. Gunpowder in fact, provided we have the time of its explosion under control, will do all that is desired; and if it did not, no assistance nor increase of power would be derivable from any of the chemical explosive agents; whilst the danger to all parties having anything to do with such shells would be immense. Were it our object to speculate on the possible number, and arrangement of chemical substances with which a theoretical percussion shell might be filled, our task would be longer, than interesting or profitable,—suffice it to say, that no class of persons expect so little actual advantage from such combinations, in a practical point of view, as chemists, and it would seem that their opinion might claim for itself some amount of respect.

From the remarks we have already made, it will be obvious that we consider the two greatest difficulties, which stand in the way of the percussion shells as fired from guns, mortars, &c., to be, 1. The danger of explosion from the primary shock of the ignited charge; 2. The difficulty of causing any given side of the shell to impinge on an object, except the spherical form be abandoned. A slight consideration will be sufficient to show that neither objection applies to shells which are projected by the force of a rocket—consequently, if those missiles can ever be made to take a more direct course, so as to be more effectually amenable to calculations, the limit to their application will be greatly extended,—nay, even in their present state we imagine the percussion shell would, in the event of another war, be for some services, appended to them.

We ought not to dismiss the subject of shells without mentioning a contrivance of most terrible efficacy, which has been suggested. We cannot do better than quote the original statement, Mechanics' Mag. August 18, 1844, which in allusion to Professor Bunsen, thus proceeds:—"He has shown that this liquid of Cadet, consists chiefly of the oxide of an organic radical, or compound base, which has a constitution precisely similar to common alcohol, but in which the oxygen is replaced by the metal arsenic. Thus the chemical formula of alcohol is

$$C\,4.\quad H\,5.\quad O.$$

and that of the new radical which has been called *cacodyl* in reference to its abominable smell, is

$$C\,4.\quad H\,5.\quad Ar.$$

"Now this body possesses the most extreme, and rapid spontaneous inflammability, the moment it is exposed to the air which oxidises it, and forms the oxide of *cacodyl* of which principally Cadet's liquor consists. If, therefore, a fragile vesse of this fluid, say a glass globe be thrown into the port hole of a ship the moment it breaks against the deck, or any hard object, the spilled fluid is in a blaze, and capable of setting on fire anything combustible in contact with it. But this is not all. The result of this combustion is the evolution of clouds of white arsenic, so that the atmosphere around becomes instantly a deadly poison! Thus if inflamed between decks the atmosphere would at once be rendered fatal; for it is well known to toxicologists that a most minute dose of arsenic taken in this form into the lungs, is almost certain to produce death more or less speedily. Further, the substance is insoluble in water, and heavier than it; so that water will not extinguish it when on fire. The oxide produced by its combustion, moreover is a violent poison. It would be difficult to conceive a collection of more formidable properties in one body, or of any more fitting it for an agent of destruction in warfare!" The writer suggests that it might have been the Greek fire, in which supposition we differ from him; although we see no other objections to its employment in warfare except the difficulty, and danger of preparing and stowing the material, added to a certain chivalric feeling which cavils at particular modes of death, although permitting others. For our part, we would hail with satisfaction any discovery that could make warfare more terrible, conscientiously believing that the application of such wholesale methods of slaughter would be the surest means of establishing universal peace. We have not the affectation of admiring war,—we wish it could cease,—but if it must be cultivated as a science, we presume, it, like other sciences, has its theoretical point of absolute perfection,—which would seem to consist in the total slaughter, of two belligerent hosts. Once render warfare perfect to this extent and men would not fight; —slaughter we take it is the main object of all battles,—this granted, it can matter very little whether men are cut in two by chain-shots,—perforated by musket-balls,—blown to atoms by bomb-shells,—or poisoned by arsenical fumes!

ON METHODS OF SUBMARINE ATTACK.

From the very infancy of naval warfare, it has always been an object much sought after, to inflict an injury on an adverse ship under the line of immersion in water. To secure this end the ancient galleys of Greece and Rome were armed with sharp subaqueous beaks, which being driven by the aid of the rowers against an advanced vessel, inflicted the most dangerous fractures and perforations. The genius of naval modern warfare did not admit of the employment of such methods of attack, and it has consequently been long relinquished:—lately, however, Mr. Nasmyth the inventor of the steam-hammer, has submitted to the consideration of the Admiralty the plan of an iron steamer bomb-proof, which, (he says,) "will effectually destroy any ship or squadron. She is propelled by the Archimedean screw, and when going at the rate of six knots an hour she will run stern on to a ship, and leave a hole in her many feet wide beneath the surface. It is in fact the power of two ships coming into collision with each other at the rate of ten knots an hour, placed by mechanical means in the hands of not more than three men."[*]

Still more ingenious was the contrivance of the American, Fulton, who actually devised a boat capable of diving and progressing under water. In the *Annual Register* for 1802, is an account of this diving-boat taken from the relation of Citizen St. Aubin, a man of letters at Paris, and a member of the Tribunate, which confirms the inventor's statement of the success of his experiment,—"I have," says M. St. Aubin, "just been to inspect the plan and section of a nautilus or diving-boat, invented by Mr. Fulton, similar to that with which he lately made his curious and interesting experiment at Havre and Brest. The diving-boat in the construction of which he is now employed, will be capacious enough to contain eight men and provision enough for twenty days; and will be of sufficient strength and power to enable him to plunge 100 feet under water if necessary. He has constructed a reservoir for air, which will enable eight men to remain under water for eight hours. When the boat is above water it has two sails, and looks just like a common boat. When she is to dive the mast and sails are struck. In making his experiment at Havre, Mr. Fulton not only remained a whole hour under water with three of his companions, but kept his boat parallel to the horizon at any given depth. He proved that the compass points as correctly under water as on the surface; and that while under water, the boat made way at the rate of half a league an hour, by means constructed for that purpose." Vol. XLIV.

However visionary may seem the idea of applying such a subaqueous boat to the uses of actual warfare, Earl Stanhope, (no incompetent authority,) entertained an opinion of the feasibility of the plan; and in the year 1803 he stated in the House of Lords, that he had given a plan to the Admiralty, a contrivance for protecting ships against such an assailant. It is said that our government purchased the neutrality of Mr. Fulton, fearing lest he should impart his secret to the French, and that in consequence of this bribe he returned to America, and the invention was not further divulged.

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[*] The fate of the sword-fish, which after perforating a ships side, finds it impossible to withdraw its weapon, and only escapes by its sacrifice, might have furnished a useful hint to Mr. Nasmyth. Granting that he could thus approach a ship and perforate it, he would find himself literally, and abso- in *a fix*. But we take it his machine would be sadly hammered about by cannon balls, and sadly interfered with by the ship's boats, long before the somewhat amusing catastrophe could occur.

The question of the possibility of subaqueous attack by means of a projectile weapon, acquired extraordinary interest during the summer and autumn of last year (1844), in consequence of the secret of an invisible shell, claimed by Mr. Warner, and the effects of which were illustrated by him on the John of Gaunt, off Brighton.

Far be it from us to disparage the merits of any inventor, or even by implication to underrate the value of discoveries to which he lays claim; much less would we join that section of a noisy and thoughtless populace, who, without proper means of forming a correct judgment, disbelieve every thing they cannot understand. We are amongst those who believe in the possibility of destroying a ship at a far greater range than 300 yards, by the agency of a subaqueous projectile: this is our opinion, which like any other mere opinion, is not infallible, although deduced from many experiments. Such being our views, we regret that Mr. Warner pursued a course of operations which could not but excite suspicion, and which would have enabled him to employ one of several *trickeries* had he so desired. We do not mean for an instant to imply that the expement was not a *bona fide* one, and that no projectile was used; we have already recorded our opinion that the use of a projectile under the circumstances was possible,—nay, that such was not difficult; all we mean to say is this: that the use of such projectile was not demonstrated, and can merely be received as a matter of faith. Mr. Warner should neither have had the John of Gaunt in tow, nor should he have approached her previously to the explosion. The mere presence of a tow-line would have afforded several means of explosion: it might be made to spring a lock, and thus explode a magazine of powder; still easier might it have been the medium of concealing two voltaic wires, which would have furnished the means of instantaneously igniting a magazine, no matter how far distant. The explosion again might have been occasioned as described by Sir G. Cockburn in the House of Commons on Wednesday, July 31.—"He would state *exactly how the experiment had taken place*. He had an officer in a boat close to the two vessels, and the officer distinctly saw the one blow up. A rope with two buoys attached was thrown across her cutwater, the vessel then going at the rate of about three knots an hour; these two buoys, by the impetus of the vessel were forced under water, and the tension of the rope attached to them either struck a hammer, or excited by other means the igniting power, and then the vessel blew up." The officer who had reported to him said, he considered that the explosion was the effect of two barrels of gunpowder." M. Jobert of Brussels, suggests that a congreve rocket headed with fulminating mercury was the missile employed,—fired on a level with the water's surface. M. Jobert could not have tried the experiment,—a rocket under these circumstances sinks almost immediately on touching the water,—besides its flight must have been visible. It is our opinion, however, as the result of some experiments, that a purely subaqueous missile can be constructed,—safe in its use and easy of application: more than this it would be premature at present to state.

CONCLUSION.

The task originally proposed to ourselves, draws near to its conclusion. During many periods of its progress, our regret has been that several interesting documents bearing on the subject, must be so summarily dismissed. The mere change of form and power which arms of all kind have undergone, is in itself a matter of great interest;—when taken in connexion with the states of society which called them into being, the interest is greatly enhanced. Clubs and wooden spears are emblems of savage life,—of men scarce a step removed from the prowling denizens of the forest. Bows and slings are symbols of a higher grade,—of men whose minds have begun to expand and grasp the first principles of mechanical science. Great was the advance made in the art of war, when the arbalest was discovered; greater that which prompted the construction of the vast artillery of old,—the aries, the balista, and gigantic catapult! Now wealthy cities rise before our view,—with walls and lofty towers,—war is no longer carried on with the petty rancour of individuals, but as the agent of facilitating some great—perhaps laudable policy. Greatest of all was that advance consequent on the application of gunpowder:—no longer do we trace the mere progress of the art of war,—no longer are we the mere narrators of the flights of missiles and the terror of their effects,—we become insensibly carried away in the torrent of a great political revolution! The discovery of printing, the mariners' compass, and of gunpowder, are referable to nearly the same date,—agents of equally revolutionary power it would be impossible to suggest; and it is difficult, at this epoch, to say whether the first or last has been most instrumental in altering the constitution of society. Amongst other consequences resulting from the use of gunpowder, we may especially enumerate two. The claim of might is more likely for the future to reside with those who have the better claim of right,—with the best educated, and consequently most enlightened states. Brute force now avails but little in modern warfare, science being all in all. The discovery of gunpowder, again, has greatly tended to the decline of feudal sway. So far as relates to the chances of danger, there can be no longer a privileged class of warriors, whom swords may smite and arrows strike in vain. No doughty knights smothered in buff coats and iron plates, figuring during peace in harmless fray; begetting a spurious sentimentality in the bosoms of our daughters and our wives, yet incapable in actual fight of being injured, and often, from their unwieldly arms, of injuring others. The time for such vagaries, thanks to the villanous saltpetre and its black offspring, gunpowder, are gone. None who now go into battle can claim immunity from danger and death; some whizzing ball, some blazing shell, or erring rocket—all very indifferent respecters of personal dignity—may come and lay a general in the dust, no less than the humblest drummer![a]

We really beg pardon of the ladies for thus slightingly alluding to their friends, the knights of old, with whom they have associated such ideas of romance. But on the first introduction of fire-arms they certainly *did* quake and complain much more than men so brave by reputation, and so petted by fair ladies, should have done. They guarded themselves too by such unwieldly mail from the annoying bullets, and must have looked so grotesque—so ungainly, whilst their poor steeds shuffled forward to the charge, groaning and snorting under the unconscionable weight of their riders, that we are sure, had our lady-friends seen them, their feelings would be more allied to mirth than chivalrous love. Then, what a most unromantic death was it to be cracked to death with a sledge hammer, like a huge lobster! But we do not wish the ladies to feel any other interest in warlike pursuits save the very proper one of regret at the existence of such an evil. We object to that exhibition of mock valour, and that mawkish, silly sentiment which the system of tournaments long kept up; therefore we trace, with peculiar satisfaction, its downfal to the introduction of fire-arms. Such are our feelings on the subject, though the ladies may call us a Goth!

Before we finally lay down our pen, we may observe, that of late it has seemed necessary by many individuals to treat all arguments concerning mysterious projectiles with much acrimony of spirit. It would even seem as though the whole subject were inflammatory,—only to be approached in a passion. We have endeavoured to be civil and just; if, however, we have on any occasion seemed too energetic, or too personal, we beg the reader to attribute the defect to an error in our temperament,—not to a studied design.

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[a] The equipment of knights and their men-at-arms was totally unadapted to the genius of warfare, after the employment of small fire-arms had become general. Each man-at-arms ought to have *five horses*, one on which he rode to the charge, and hence called a charger; the others to carry his trappings, and to bear him on the march. Some attempt was made in Germany to diminish this unwieldy retinue by allowing each man-at-arms only one horse, but a waggon to every twenty men. See the Arte of Warre of Machiavelli, translated by Peter Whitehorne.

NOTES OF NEW BOOKS.

Harris's Napoleon.—Collegian's Guide.—Borrer's Journey from Naples to Jerusalem.—White's Constantinople.—Dyce's Beaumont and Fletcher.

High in the list of poetic enthusiasts must be placed the name of Mr. William Richard Harris, who has published in a handsome quarto size, bound in crimson and gold, "An Epic Poem in twelve cantos," entitled "Napoleon." Mr. Harris is not very modest in the tone in which he speaks of himself and others in his preface. He takes a long leap from Milton to himself, and says that until the appearance of "Napoleon" there has been no epic poem since "Paradise Lost." This is obviously going a little too far, Pye, Southey, Montgomery and others having published so-called epic poems in the interim. Mr. Harris probably did not forget these, but only meant to say that none of them were worthy of standing beside himself and Milton as poets in this high walk of the art. Now we have read a good deal of Milton's "Paradise Lost," and some little of Harris's "Napoleon," and in one point they seem to bear some little affinity, in quality if not in degree; Johnson, it will be recollected, said that he could never get through the "Paradise Lost;" and for our part we have found it utterly impossible to get through a single book of "Napoleon." Whether this be a sign of excellence or not we pretend not to say, but we pronounce the fact fearlessly. So on the other hand Harris and Milton differ materially in the treatment of their subject. Milton makes his Satan a hero, almost too interesting a character for the sake of the moral; Harris makes his hero a devil, and no mistake. He has a British, high old Tory hatred of "Boney," and makes him cut a very sorry figure. The scene opens with the Russian expedition, and ends with Napoleon's return to Paris: in the course of the poem, the various incidents of his career are given. Here is a specimen of the opening, which is an admirable admixture of the Homeric and Miltonic:—

"Say, whence this mighty army?—who their chief?
From Gallia they, a fair and fertile land;
Napoleon their dread captain—awful name!
Whose conquests, glories, crimes and sudden fall
No feeble muse may sing. Thy mighty deeds,
Proud Corsican, demand Homeric lyre;
Or his, who told to an admiring world
How godless Satan from ambition fell.
Like his thy fall, never to rise again!
At thy approach, Napoleon—at thy frown
All Europe trembles, all her kings turn pale;
Britain alone, confiding in her God,
Thy madness watches, and foresees thy doom.

* * * * * *

No 'spotted leopard' then before thee quailed,
The British lion, *roaring, seized his prey!*"

A fine image this of the battle field of Waterloo. Now for a more quiet scene. The discomfited tyrant returns from Moscow; an exciting dialogue with the Abbé du Pratt ends thus:—

"'Madman he went, and madman is returned,'
In pensive mood the subtle Abbé, said;
'Adieu, indeed, Monsieur l'Ambassadeur.'"

But the scene with the hapless Louise is exquisitely sterling. She has given him a short curtain lecture on his mad pranks, and he feels it:

"For once abashed, confounded, motionless,
The vanquished conqueror stood, and smiling sad,
In faltering voice replied: 'Beloved Louise!
From the sublime to the ridiculous
Is but a step; that step, alas, I made.
I need repose; my heart is sick and faint;
The flames of Moscow scorch my inward soul!
But I forget: how is our darling boy?
Let me behold him ere we sink to rest.
Alas, alas! I dare not kiss thee, child,
I have dethroned thee, pretty innocent!'

. . . .

Rent is the dazzling veil; the man of blood—
Stripped of his meretricious lustre—paler,

NAPOLEON THE DESTROYER STANDS POURTRAYED."

Mr. Harris prints the last line half in large capitals and half in small, but we can only afford the latter. We have gone so copiously into the merits of this ambitious work, because although printed for publication, we doubt if it will fall into the hands of many of our readers.

A book entitled "The Collegian's Guide; or, Recollections of College Days," has recently been published by a mysterious gentleman who styles himself "The Rev. **** ******, M.A., —— College, Oxford." A good work, giving sound practical directions and advice to young men as to their studies and pursuits at alma mater, we have long felt to be a desideratum; but the work before us is not the sort of book we mean. It is filled with vulgar gossip about the boyish pranks of the "men" (as the younkers are termed when "keeping terms,") the scouts, shopkeepers, "dons," &c., but offers no sage counsel which a youth really desirous of steadily pursuing study could avail himself of. The language, moreover, is so *slangish*, that but for the announcement in the title page, we should scarcely have thought it had been written by a clergyman. He talks of "feeling queer," calls his father "the governor," and the clergyman of his parish "the parson," talks of a dignitary in the university as "a sharp practitioner," says his governor "would have his say," besides innumerable other vulgarisms which savour strongly of the Pickwick Club.

Mr. Borrer's "Journey from Naples to Jerusalem by way of Athens, Egypt, &c.," is one of the most lively and entertaining books of travel which have lately appeared. The author is a young man, and his views and notions come with freshness and force, his colouring bringing every thing that occurred to him into strong relief. At the same time it must be added, that the scheme of the narrative is superficial, and that if the reader looks for any thing beyond animated incident and lively description he will be disappointed.

Very different in this respect is Mr. White's "Three Years at Constantinople," in which we have a most careful and elaborate view of the whole state of society in that wonderful capital. Every trade and calling, every social and political relation comes in for its share of attention; and having perused the whole, one finds oneself possessed with a mass of facts which, whilst they form a very perfect picture in themselves, dispel many false impressions which one had been led by the careless use of general terms to entertain. On the subject of polygamy for instance, which one is always led to imagine to be so common in Turkey—that to call a man "a Turk" is a denunciation of wholesale incontinence; perhaps never was more injustice done the followers of the True Prophet. Polygamy is allowed by law, but it is the exception and not the rule. In the first place, "marriage is chargeable" at Constantinople as well as in London or Paris; this is a serious drawback to the entertainment of a plurality of wives. Besides this, there is another drawback, for all these wives have their rights and privileges, in short, a sort of domestic etiquette prevails, which the poor man must not violate; in a word, whilst the poor man dreads the expense, the rich man dreads "the inconvenience," (hear this, ye ladies, "the inconvenience!") and so the result is, according to Mr. White's observations, that "among the lower, middling and secondary classes scarcely an instance is known of men espousing two wives:" and as to the higher classes, "Upon the most minute and repeated inquiries I could not hear of more than fifteen or sixteen persons who were known to have availed themselves of the law of polygamy." If the Constantinople "Turk" were to take a lesson or two from those so called at Christian courts, we might find out a way of avoiding "the inconvenience" of keeping several wives, if not the expense. But he, poor man, is obliged to have them all about his ears in the same house. We recommend Mr. White's book as one well worthy of perusal.

Mr. Dyce is editing "The Works of Beaumont and Fletcher," and has already issued seven out of eleven volumes, of which the series will consist. The extraordinary inaccuracies and interpolations which the players' editions of these plays contain; as indeed is the case more or less with all the like editions of the productions of that period, are matter of notoriety to all who have read them; and it is only due to the memory of the authors, and to the taste of the literary public that they should have an edition before them purged of these blemishes. Mr. Dyce has executed his task with great patience of research and discriminating taste, which entitle him to our warmest acknowledgments.

THE UNIVERSAL SALVAGE COMPANY.

Edward Austin's Patent.

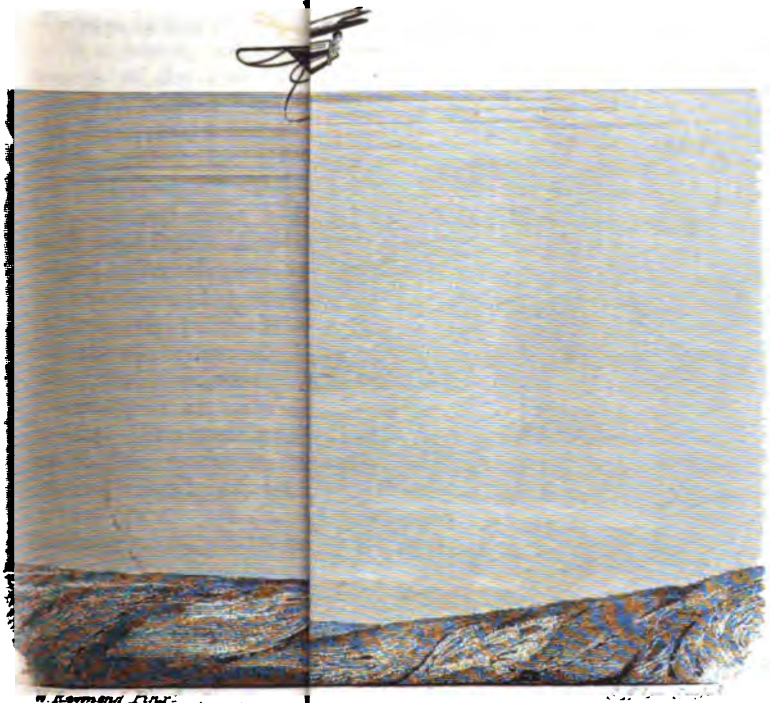
Since our last number, this company has so far advanced, that it is most probable that it will be enabled to come into early operation: we have read with much attention the prospectus it has placed before the public, and we have no doubt, whatever, that to a maritime and commercial nation it is likely to prove of the highest value; the following extract is one that will be considered conclusive:—

"The history of the casualties of the royal and commercial navies of this great maritime country affords melancholy proof of the immense losses annually sustained by shipwreck. Indeed, so great is the amount of treasure and valuable property sacrificed to the sea, that the wrecks which lie submerged in the seas of Europe, especially on the coast, within the latitudes of 36 and 56 degrees north, and in known localities, are calculated to contain property to a greater amount than could be found in a tangible shape upon the surface of the two kingdoms of Spain and Portugal. This immense treasure receives constant augmentation from wrecks occurring upon the different coasts of Europe to the estimated amount of about four millions annually; and these wrecks, in many instances, occasion other wrecks from the obstructions, and especially the foul anchorage, caused by them, when ships are sunk on anchorage ground. In the years 1835–6, this interesting and important subject was investigated by a committee of the House of Commons, who, in making their inquiries, selected two periods of three years each, viz. first, from 1816 to 1818 inclusively; and secondly, from 1833 to 1835 inclusively; and reported according to Lloyd's books, that, in the first period, the total number of ships or vessels wrecked or missing appeared to be 1203; and in the second period 1702. About the middle of the last century, one hundred vessels were lost in a single gale of wind at the port of Cadiz.

"These facts sufficiently demonstrate the magnitude of the losses occurring from vessels wrecked at sea, and the importance of any attempt to retrieve them. Such attempts have not been

ANY.

For carrying [illegible] Naval Vessels &c. &c.



W. Raymond Pinx.

A. *Purchase ower to taughten purchase Chain.* F. F. *unt Chains at equal distances.* C *if necessary the Centre purchase. ised without the tedious, expensive, nverted into Life Boats &c.*

unfrequent; and the most usual have been by means of the diving-bell. In the year 1683 (about a century after the first exhibition of the diving-bell in Europe before the emperor Charles V. of Germany) William Phipps, founder of the noble house of Mulgrave and Normanby, formed a subscription, to which the famous General Monk, Duke of Albemarle, largely contributed, for searching and unloading a Spanish galleon, sunk about forty-five years previously, on the coast of Hispaniola (St. Domingo). After one or two failures, Mr. Phipps succeeded, and returned in 1687 to England, with treasure amounting to 300,000*l.* sterling. The tenth part accrued to the king: the Duke of Albemarle's share was 90,000*l.*: and subscribers of 100*l.* received 10,000*l.* each from the adventure. Large, however, as was the fruit of this enterprise, the result obtained from the use of the diving-bell, in cases of salvage, is but partial and incomplete; nor is it improbable that an amount of treasure remained in the galleon, after the operations of Mr. Phipps, larger than that which was recovered by him."

If a survey were made of the wrecks which surround the coasts of the United Kingdom, similar to the one made of wrecked vessels on the coral reefs round the small island of Anagada, West Indies, by order of the House of Commons, in 1824, such a survey would astonish the world that so much valuable property should have lain so long, and almost daily increasing by other wrecks, within the immediate reach of the first maritime nation without any effectual means, on a large scale, being adopted to recover them. We frequently read that such a vessel has sunk, the crew saved or drowned as the case may be, the public lament the occurrence, the parties interested set about recovering the loss of property from the underwriters, the claim is adjusted and both parties endeavour to forget the catastrophe as soon as possible; although the vessel, worth several thousand pounds, has sunk in twenty fathoms water only, her position easily ascertained, every facility to pass chains round her to recover her, nevertheless there she lays given up as lost for ever. Take, for instance, the Phœnix steamer, sunk off Dungeness, and many others we could mention; it is to be remembered also that several vessels of war laid sunk at Spithead upwards of fifty years, and that it is only within the last few years, that the application of the galvanic battery and the improved diving dress, induced the government to recover the effects of part of those vessels by means of the tedious and dangerous process of diving, and by the former to destroy the vessels by blowing them to pieces, creating vast labour to recover the fragments. Many persons imagine that when a vessel has sunk she is immediately destroyed by the action of the waves; such generally is the case in very shoal water, on rocks, &c., but when the depth of water is beyond the swell or break of the sea, such vessel will remain whole for many years; for example, the numerous foreign vessels of war and others sunk many years back, whose position and condition are well ascertained, also the Mary Rose, one of Henry the Eighth's ships, sunk off Spithead near three hundred years back, the divers have visited her, ascertained her position, several guns have been raised from her, and they have reported that although she is covered with innumerable shell-fish, she appears whole and in fair condition; and an opinion has been expressed by those capable of giving one, that she could be raised by the power of the atmosphere applied according to Mr. Edward Austin's patent method. Really this is so interesting a subject that we must beg permission to call the attention of the scientific world to the fact that a vessel of so ancient construction lays in a moderate depth of water, within a short distance of the shore, that it is capable of being raised by the application of the above invention, and placed in one of her Majesty's docks at Portsmouth.

Several individuals have lately, by means of the diving dress, realized considerable sums of money from wrecked vessels on the coast of Ireland, in the Mediterranean seas, the Azores, &c.; and one of the steam tug companies at Liverpool, during the last year, recovered a vast amount of cargo from wrecked vessels; and they placed in the hands of Lloyd's agents at that port upwards of £20,000 recovered from one vessel; also, during the last four years, another party has been working by the same means successfully in various parts of the Mediterranean. They visited the bay of Navarino, and recovered several brass guns from the Turkish vessels of war sunk in that port (upwards of 100 including the transports). The Greek government had employed their divers previously to the depth of nine fathoms, which was their limit, when the parties alluded to arrived and carried on their operations to eleven fathoms; but the pressure of the water became so great and distressing to the men that they could not descend to a greater depth, and the pursuit was given up, leaving immense wealth untouched, and the more wealthy and large ships sunk in deeper water, and in still weather are easily discerned. The same divers entered into a contract with the Turkish government to receive fifty per cent. on all they recovered from their vessels. They operated by the same means on the Turkish admiral's ship, on board of which the wealthy Turks had placed their treasure during the revolt at Scio, this vessel took fire and sunk, from it they recovered much valuable plate and a brass gun weighing between six and seven tons. These successful ventures have been kept quiet for certain reasons, but such and similar facts clearly prove that if parties with limited means and power can accomplish so much, there is an ample field open for the "Universal Salvage Company," with capital and unlimited lifting power, to realize immense wealth, for they are unshackled by any expensive machinery or establishment. Their operations are expeditious and economical, having accurately ascertained the value of the proposed ships to be raised, her exact position by their simple and ingenious method by buoys on the surface of the water, the probable expense to accomplish the object is easily known. The large per centage of thirty-three and one-third per cent. which the salvors are entitled to by law, must, if their business be conducted with common prudence, enable them to pay a large dividend on their shares as well as to restore a vast amount of property to underwriters and others who, in many instances, have been ruined by the sad and melancholy catastrophe, shipwreck.

Another important feature proposed by this company is to establish a steam vessel, or more, in a position, especially during the winter months, what is likely to be of essential service to ships in distress entering the Downs or the river Thames. Numerous are the instances of vessels perishing with their crews in sight of hundreds of spectators on shore without possibility of aid being rendered them by the present means; and although there are upwards of thirty steam vessels employed as tugs on the river Thames, strange to say, there is not one of them fitted with proper anchorage geer or the means to recover them in rough weather, or to continue for any time in a gale of wind exposed to the action of the sea without being herself destroyed; therefore it is impossible that such vessels can render assistance to a ship in bad weather. These are facts beyond contradiction, and are well known to the pilots; we therefore hail with satisfaction the proposal that a steam vessel be constructed combining all the late improvements, and capable of continuing under weigh in severe weather to render assistance to ships on entering the Thames, which, no doubt, will be the means of saving many valuable lives and much property; and from the sums of money realized occasionally by the class of vessels just described, the expectation is justified that a handsome profit will be obtained on the capital so employed.

NEW NOVEL.

Illustrations of American Indian Life.

THE American novelist Cooper, by his delightful and hitherto unapproachable fictions, has created a taste for this class of romantic literature, which will be very far from extinguished on his retirement from the stage of life. The exciting and pituresque existence of the American Indian; the scenery of the mighty wilderness of that great continent; the extraordinary features of adventure and manners which characterise the aborigines, demand new chroniclers, to supply the vacuum, which Cooper's absence will one day create. Mr. Percy B. St. John is eminently calculated, should he perseveringly pursue the path he appears to have marked out for himself, to fill this vacancy. Intimately acquainted with Indian manners, customs, habits, feelings, &c.; familiar from residence in the backwoods and wilds of the American continent, with the scenery and physical peculiarities of that part of the world, his imaginative powers are very great; while his style and diction is graceful, neat and vigorous. Mr. Percy B. St. John is evidently a young writer, with therefore much opportunity for improvement. His tales, sketches, and narratives, in the mere popular periodicals of the day having excited considerable attention, he has, it appears been induced, to produce a little volume of tales[a] which are now before us. "The Trapper's Bride" is both exciting and amusing, with a dash of much utility. It illustrates the curious "commerce of the prairies," and describes in animated language, the life led by the trappers, "who wander through the sublime scenes of grandeur and magnificence,—through the soft beautiful valleys,—by the lakes,—the thousand rills, rivers, and brooks,—the romantic glens,—the gravel knolls,—the bluffs of sand and limestone,—the ravines hundreds of feet in depth, —the mighty insular mounds of earth towering on all sides, —the embankment of congregated hills,—deep and irregular chasms,—frowning precipices,—and hideous fractures which compose the rocky mountains." The characters introduced are Pierre Lancel and Ephraim Smith, the former a Swiss trapper, the other a rich and humorous yankee, who makes an engagement to steal an Indian wife for the benefit of the latter. The joint adventures are described with very great happiness. We feel a great and sustained interest in their fortunes. Their camp on the upper waters of the Arbansas, their meeting with the Canadian trappers, are all points of interest; but the following is a better specimen of the author's style and manner:—

"Above, the sky was blue and serene, while on all sides light fleecy clouds, the guazy vapours of a summer morn, were creeping lazily along the silent heavens, flying from the vast arcana of storm and tempest in the hills of the Stony range, where nature seems to fashion the hurricanes that so often sweep the plains of the great prairie wilderness, spreading desolation in their track; not, however, without their counteracting good, in purifying the air, and tracing an atmosphere, which otherwise would, perhaps, be dull and heavy. The wind was light and gentle, breathing in balmy sweetness upon the warm brows of the travellers; and though no carolling birds welcomed the rising sum,—though no green and grassy meadows reflected the rays of man's glad luminary, though the soft music of the breeze in the rustling boughs of pine and sycamore, was not there heard, to infuse a sense of joy into the souls of the wayfarers, yet did Pierre and Ephraim rejoice in the loveliness above. But a low growling sound had drawn their eyes towards the far horizon, and there a small cloud no bigger than a man's hand, but black as Erebus, was rising in a bank of vapour. On it came, spreading with lightning speed o'er the fair surface of the blue and smiling heavens; but a minute since, it was one speck of night in a vast ocean of clear sky, but borne on the mighty wings of the blast its dark outline spread across the whole range of the east, obscuring the sun, and clothing the vault above in a funeral pall, that rolled swiftly, but majestically, towards the mountains: on it came, huge columns of dingy vapour, vast masses of inky darkness crowding in wild and furious tumult along, mountain upon mountain of towering clouds, big with the awful artillery of heaven, pregnant to bursting with the weight of waters and marshalling for the contest that was to come. Long bursting gusts of wind were felt, and then large drops of rain came pattering down swiftly, upon the heads of the devoted pair. Long ere this, however, Ephraim and Pierre had prepared for the tempest. Unslinging their guns, the muzzles were carefully stopped up with corks, kept in their pouches for the purpose; while round the locks several pieces of leather were wrapped, with the most studious care. The powder-flasks were bestowed away in the dryest possible corner of their habiliments, and then, drawing their caps close over their ears, and buckling their waistbands tight, they turned their backs on the tempest, and proceeded on their way. Without hope of shelter, they had no alternative between advancing and standing still, of which the former was plainly the wisest. Meanwhile, thunder gust upon thunder gust followed, the rain fell in cold shivering floods, it poured in torrents, it pelted in heavy sheets of water, and the stony plain was one vast ocean of dancing puddles. The din was tremendous as this reeling shower roared, rushed, foamed along, howling like some huge cataract, and, pursued by the furious wind, flew literally alone the surface of the level prairie. It was a bleak and chilling nor'-easter, cold, cutting, and unmerciful. It was of no avail to draw their deer-skin frocks tightly round them, the wind penetrated to their very bones, it deafened their ears, and wrapping all around in one vast veil of spray, rendered, as it groaned by, all objects invisible at the distance of a few yards. Indeed, after the first burst of the tempest, it was impossible to tell the direction in which they were advancing, but by trusting to the wind, and taking care to keep this always in their rear, they do not diverge much from the right way. Suddenly, a flash of lightning, almost blinding them, rendered the whole vault of heaven a fire-roofed cavern; a sheet of flame, perfectly awful in its intensity, poured its fury over all, illumining the wild scene around, and for a moment hushing even the raging wind. The mountains stood out in bold relief, the pebbly plain looked as if seen through a microscope of flame, and all nature assumed a ghastly hue. Then came the thunder-peel, to meet which the two travellers closed the apertures of their ears with their fingers, striving to deaden, at all events, something of the violence of the sound. The mighty roar of a battle-field, where a hundred cannon pour forth their belching fury, could give no idea of the tremendous, nay, the infernal nature of this explosion. It seemed to rend the very heavens in twain. Then all was hushed, the rain ceased, the wind died away, the echoes of the live thunder gloomily groaned from the far-off hills, the sky broke, the deep azure prevailed, and the storm was over. Such is the violence, and such the brevity of these prairie tempests."

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[a] The Trapper's Bride, a tale of the Rocky Mountains; with the Rose of Ouisconsin; by Percy B. St. John. London, Mortimer, 1845.

The most pleasing passage however in this tale is the description of the Eutaw village, with the exception perhaps of the dream of the tired and hungry hunter, which is very original. From the former we quote briefly. "Bursting from a cleft rock seemingly rent asunder by violence, the spring came rushing in a foaming cataract upon a stony ledge, whence, spreading and bounding in a sheet of water, two rivulets ensued from the intervention of several spars of granite and other masses of stones, which flowing in separate beds, rugged and rapid, were both, after leaping o'er stones and rocks, after gushing through secret ways, being here lost and there found, in one place a wide shallow stream, in another a deep silver thread, finally united in a black pool wandering ceaseless ages in the side of the mountain; overflowing this, a tumbling cataract brought the water to the edge of the great chasm, thereinto falling in a sheet of vapoury spray, and forming a small lake, the exit of which was unknown, being of course subterraneous."

The tale is full of similar graceful pieces, while the rose of Ouisconsin, with its descriptions of Cedar lake, of Sycamore creek, of the pilgrims's camp in the woods, of the Indian fight, of the loves of Alice and Harry, the adventures of the Tuscarora girl, is a story which must be popular. We certainly advise Mr. St. John to pursue the publication of his illustrations of Indian life.

ON PRUSSIC ACID AS A POISON.

Lectures on Materia Medica.—Lancet.

Several cases have lately been painfully brought before the public attention, in which prussic acid has been used for the purposes of suicide and of murder; the first feeling excited is that of surprise that the sale of so terrible a poison should be so unrestrictedly allowed; unless for some improper purpose, it can scarcely ever be required by the non-professional man, and the danger and skill demanded for its preparation would be some safeguard against its manufacture by any but chemists. The plea under which it is generally obtained is to destroy some animal; but the instantaneousness of the death produced by this acid, even in its most concentrated form, is much exaggerated. There is a short, but a very distinct interval between the taking of the poison and death: animals destroyed by it give a cry singularly expressive of pain, and are strongly convulsed from the apparently acute agony they suffer; nor do we think that even on the grounds of saving some old favourite animal pain it is preferable to laudanum, and yet only on this plea is it ever vended.

For suicide this poison has over all others this terrible advantage; when once the fatal phial is to the lips, no earthly power can stay the course. Antidotes are useless. Almost ere the alarm can be given the deed has been accomplished; and even if an antidote were at hand, with the quantity taken, in nine instances out of ten it would be useless; and when first taken the nervous system is so violently affected as to render the approach, even of a friendly hand, dangerous; the teeth are firmly fixed; and when the sufferer falls exhausted, the poison has spread too far into the system to be counteracted, even though the antidote were administered within the few seconds that life then remained.

In debarring the suicide from this deadly poison, we could not hope to prevent one determined to put an end to his existence from effecting his deadly purpose; we will admit this in its fullest extent to those who advocate its sale upon the grounds that were it forbidden, a plunge from a bridge at night, a rope, or a fall from some high place are still within his reach; or even if excluded from these, oxalic and other corrosive acids producing death with the most intense agony are still left. But the cause is here marked out: time in every poison, save this, is afforded to the sufferer to free others from suspicion, but here a method of murder is offered by which, if care is taken, it would scarcely be possible to detect the murderer—a sudden fall, a person is seen applying sal volatile, and all traces of the poison are immediately lost, suspicion would indeed scarcely arise; if it did a country surgeon would recognise the familiar smell of ammonia. It is undoubtedly true, that even though united to ammonia, the presence of the acid might be shown by delicate tests; but the composition of prussic acid is against any certainty; it can be produced from animal fibre or from blood; for the purposes of commerce it is procured by heating hoofs and potash in an iron crucible, and its extreme proneness to decomposition would present another still more serious difficulty; unless made from the ferro-prussiate of potash, it changes in a few hours into ammoniacal compounds. The cyanuret of potash prepared as advised by Professor Liebig, by heating the oxide of manganese with the ferro-prussiate of potash, in two hours commences to evolve ammoniacal vapours, and within the twenty-four hours is entirely decomposed; the deadly poison is by chemical combination changed into the stimulant, which undoubtedly is its most efficient antidote. It is true, the advance of science has rendered the evidence of chemists of a far different character from that tendered on the trial of Sir Theodosius Boughton, upon which the fact of poisoning by prussic acid was considered proved after an interment of seven years; the evidence then considered as most conclusive would now best expose the incapacity of the witness. In a late inquest, the fact of the surgeon not being aware of the ease with which this fatal poison could be made from urea and animal bodies, deteriorated his otherwise valuable evidence; and chemists are the more called upon for care, as the judges have lately considered it necessary to check the importance which chemical evidence so naturally exerted on the minds of the jury. The analytical chemist should not tender his evidence as if he regarded it as conclusive or otherwise of the guilt: in Madame Laffarge's case, the verdict depended upon the discovery by Professor Orfila of a minute portion of arsenic, which had escaped the researches of six experienced chemists, while that strong link of circumstantial evidence which established the guilt was comparatively overlooked; but here the poison can even perform its deadly task without being swallowed. Dr. Collier witnessed a case where a lady steeped some fur into the poison, and then endeavoured to swallow it. The piece stuck in her throat, and though aid was immediately given, she perished. Had sal volatile been freely given, it would have been nearly impossible for any chemist, however skilled, to have recognised, by the most delicate test, the presence of this poison after a few days; yet Captain Donellan was executed for the murder of Sir Theodosius Boughton, by the administration of an essence of bitter almonds; now, the evidence of the existence of an extremely volatile poison could not, after seven years, have been depended upon; and the more particularly as the witnesses, without exception, fell into the serious error of asserting that the decay of the corpse commencing immediately after death was an undoubted proof of the administration of poison. Experience has since proved the gross inaccuracy of this absurd statement, yet in the summing up of the judge we find this assertion urged most strongly against the prisoner, while the strong and damning facts of his possession of a book giving instructions to prepare the poison, and the apparatus required to prepare it, with the sudden death of the young man to whose property he succeeded, were passed over. The death was here accompanied with great agony, and where the poison is so weak as to allow a struggle, the pain is evidently of a most severe character. The evidence of the witness on the inquest on Mrs. Belaney most painfully showed this; the acid was here, indeed, so weak, that had the slightest energy been displayed she might undoubtedly have been recovered. The judge, on the trial of this case, appeared to give but little weight to the evidence of the chemists and physicians, and this we fear will be even more strongly marked. We admit that the positions taken by the chemists and physicians would, if admitted, have superseded the necessity of legal inquiries; one of the most scientific stating, as in the case of Mr. Macnaughten, that the mind of a man capable of committing a murder could not be in a sound state, and that the criminal required the application of medical instead of legal correction, to renew the harmony between the passions and their counterbalancing faculties.

The prussic acid, prepared as directed by the Pharmacopeia, is very dilute, containing 2 per cent. only of the acid. The strength of Scheele's, which is continually referred to by physicians, is not known, the professor having in his form omitted to state the quantity to be distilled over. The first quarter of an hour would, therefore, if the operation were carefully conducted, yield an acid, three drops of which would destroy a small animal; while that prepared by another chemist who would continue the distillation for several hours would be weaker than the dilute acid directed by the Pharmacopeia. This great difference in the preparation of the acid has produced several fatal accidents, particularly in France, where, to secure uniformity, Gay Lussac introduced the plan of producing acid of the highest possible strength. Cyanuret of mercury was decomposed by the addition of its own weight of strong hydrochloric acid; the receiver was kept cool in ice and salt, the acid distilled by the gentlest heat passing over dry chloride of lime to absorb the excess of water; in this way an acid is procured the inhalation of which is sufficient, during the trifling escape inseparable from the most careful distillation, to produce headache, and occasionally stupefaction; flies near it are observed to fall dead, and while transferring it to a bottle the operator is forced to hold his breath. Acid of this terrific strength is not kept by any chemist in England. Majendie, the celebrated French physiologist, on the other hand, recommended an acid weaker than that prepared by our Pharmacopeia, mixed with a syrup; but at his own hospital the dreadful preparation of Gay Lussac was administered for his own; the medicine was poured out and swallowed, and nine or ten had taken the dose before the fatal convulsions of the first patients showed the mistake. Remedies were immediately given, and some, we believe three, were saved; but as if a fatality was to be attached to this medicine, no sooner is it recognised by physicians and admitted into our Pharmacopeia, and every chemist required to keep it, than we find it the general weapon for murder or for suicide; and though an unobjectionable form is given in the Pharmacopeia, physicians still adhere to the uncertain form of Scheele. The advocates of the strong acid have but to increase the dose of the Pharmacopeia preparation to ten drops, to satisfy themselves that giddiness and other signs of too large a dose are produced by this, the dilute acid, with the same certainty as with even the strong acid of Gay Lussac.

Prussic acid consists of charcoal, hydrogen, and nitrogen; the known affinity of the two latter to form ammonia is the cause of the tendency of the acid to be decomposed, and the cyanate of ammonia being itself a very volatile salt, renders its trace still more evanescent.

The Midshipman's Friend, by ARTHUR PARRY EARDLEY WILMOT. Cleaver.

This manual we can most strenuously recommend. It is a gift that every parent should present to his son on sending him into the naval service, for not only does it teach him the general outline of the profession the youth is about to embrace, but it inculcates those principles which distinguish the officer and the gentleman, in forcible and sensible language. The practical information which is required for the management of the ship under ordinary circumstances is clearly given, the duties of the midshipman properly defined, whilst the discipline of the sailor, his habits, his morals, are ably discussed. We were particularly pleased with the observations on visiting foreign ships, and the benefit to be derived from mingling with the officers of different services, and on the necessity that exists for every one now entering the navy becoming acquainted with the nature and powers of the steam engine, thus rendering the officers entirely independent engineers, who have too often been the complete masters of the vessel from the machinery being only understood by them.

An Essay on Aerial Navigation, by JOSEPH MACSWEENY, M.D. Purcell and Co., Cork.

A very entertaining history of aerostation, with some valuable information on the mechanism of that portion of created beings to whom a structure fitted for flying has been granted, there is, however, but little new information given as to means by which this power may be brought to a greater degree of perfection. Those who have most energetically pursued the subject, seem almost to have abandoned the hope of being enabled to direct the motion of an ærial machine, although the practicability of floating in the atmosphere is sufficiently demonstrated.

Three Sermons, preached in times of public anxiety. Cleaver.

These sermons are remarkable for a high tone of feeling, and are addressed to persons in the first stations of society, having been preached in the Chapel Royal, St. James's, before the highest authorities of the realm. The first is against subtle constructions of religious obligations; it warns the legislator against sacrificing Christian principle to political expediency, trifling with his conscience, hazarding his eternal salvation for temporary interests, and that the principles of true religion can only be implanted in a nation by the example of the maintenance of virtue in its strictest acceptance by the higher and highest of the realm. The second, against wavering on the day of trial, inculcates the necessity of seeking during the whole of life, in whatever situation man may be placed, the kingdom of God and his righteousness. The last, against compromise of religious truth, is a forcible appeal to all to abide by the Established Church, and not to wander each after his own will worship by which religions are multiplied and invented, having none of the foundations of truth. There is much eloquence in the diction, skill in argument, and true knowledge of Christian principle in these well timed compositions.

MUSIC.

Music of the Month.

WE have had so little time to bestow on the compositions of the day, that our musical readers must have felt that we have neglected them of late, but the fact is, that the "divine art" has but just broken through the enslaving bonds of custom, and raised her voice among us. Of those who rank as the most zealous in breaking her fetters is Madame Dulcken, whose delightful soirées afford to the amateur the opportunity of hearing those noble and lovely compositions which fashion at present pro-scribes, and postpones to the demands of a craving appetite for novelty. It is at her parties alone that the inspirations of Weber, so unfettered by mere forms and conventional treatment, are heard to perfection. It is at them that we are sure to escape from the *Briarean* conceptions of those artists who have usurped the empire of the piano, before which all other classes of composition stand humbled and abashed. Madame Dulcken has this season added a full orchestra to the other attractions of her delightful performances. The effect of this band, filled with finished artists, is reviving to the spirit; it recals those days when the great pianists ascended the platform of the orchestra attended by the *élite* of the opera and philharmonic performers, to embody the thoughts of the great *mental* musicians. Now, without denying to the names of Thalberg and his *compères* their full meed of praise, we have too constantly to regret the absence of this most cherished source of musical enjoyment, for which the wonderful, but not *therefore* pleasing effects of the solitary pianoforte must be our quittance. There is one peculiar point respecting the modern class of pianoforte music to which we invite the most particular attention: it is this, that the whole interest in the *performance* centres in the *performer*. We will fearlessly maintain that no one who could dare to defy fashion by such an assertion of independence, could honestly say that he or she admires, still less loves the productions of this Schœnobatic school. But enough of them.

A Mademoiselle Schloss, who has arrived with strong recommendations from Mendelssohn, appeared at Madame Dulcken's last soirée, and amply justified the Doctor's eulogies. Her voice is not merely musical, but music; and her use of it not of custom, but of nature.

A concert was given early in the month by M. Benedict, aided by a host of vocal talent, at the Hanover-square Rooms, to exhibit the capability of an invention called the "Æolian attachment," a modification of the seraphine, capable of being appended to our pianoforte. In the above rooms the thing was so complete a failure as to disappoint the expectations of every one present. It may be useful in a smaller space for the purposes of sacred, or at all events solemn music. A great feature in the programme was the performance of two of Rossini's "Cori a tre voci," called "*Fede et e Carità*," by a choir of fifteen female voices, comprising among others, Madame Caradori Allan, Miss Rainforth, Mrs. A. Shaw, Madame F. Lablache, and Sara Flower. The performance was exquisite, and will no doubt be much sought for during the season.

MISCELLANEA.

ANCIENT TUNNEL.

A LETTER from Marseilles, in the French papers, mentions the discovery of an ancient tunnel, passing from the old Abbey of St. Victoire, and running under an arm of the sea covered with shipping, to the tower of Fort St. Nicholas. It is considered to be Roman, and is formed of a single vault, of sixty feet span, and one-fourth longer than the Thames Tunnel.

DESTRUCTION OF THE PORTLAND VASE.

On Friday, the 7th ult., that unique and beautiful relic, known as the Barberini or Portland Vase, which was deposited in the British Musem for security by his grace the Duke of Portland, was wantonly destroyed by a miscreant of the name of Lloyd. The missile used was, we believe, a Babylonian brick, and the vase was smashed into a thousand pieces. The miserable wretch, on being examined before the magistrates, was found to be quite sane, but alleges that he was excited from the effects of recent intoxication, and had no malicious intention. All that the law allowed the magistrate to do was to send the fellow to prison for two months for breaking the glass case in which the vase stood, in default of paying the value of it, namely, £3[a]. This is not the first outrage of the kind which has been committed upon the property of the public. Some time back, a man thrust his stick through a picture at the National Gallery, and he got off with a fine of £5. In France, such fellows would be sent to the galleys; and it is absolutely essential that some measure of rigour should be adopted in this country, to deter drunken and dissolute fellows from such outrageous and wanton mischief.—We learn with great satisfaction, that there is every prospect of a restoration of the vase, and that the pieces are so fractured that adhesion can be made. Of all the cements for such a purpose, we would recommend that which is known by the name of the Poo Loo. We have generally found that it surpasses every thing of a similar nature, and that fractures of the very worst description have been remedied by its use.

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[a] He has since been liberated; some anonymous correspondent having forwarded the amount of fine to the magistrate! It appears that the delinquent is a student of the Dublin University, and was over here for the vacation to see the sights, &c.

MINING IN SPAIN.

In the volume of the Polytechnic Review will be found several interesting papers relative to the History of the Discovery of Mines in Spain, even in the age of classic history, when first Europe became acquainted with a country abounding in the riches of the earth. We pointed out localities in which mines had been worked at an early period, and expressed our regret that they should have been abandoned by the Spaniards for the more tempting treasures of the gold of Mexico and Peru. We now hail the revival of a desire to dig from the bowels of the earth the metals so useful to man, and we are glad to see that English industry and capital are brought to bear upon so important a work. The reports from the Superintendent of the Andalusian Mining Company exhibit ample proof of the success that must attend its operations. The mines are so close to the level of the earth that expensive machinery is not required, and every facility is offered to work them. There is little speculation, for absolute proof of the value of the mines in the province of Andalusia is daily given.

IMPROVEMENTS IN LITHOGRAPHY.

The introduction of steam would appear to have successfully removed one great cause of the expense of this method of engraving; the artist was forced to leave his task to work himself at the press. By an ingenious modification of the steam power, the artist is now enabled to avail himself of this power, and the work will be done not only much better but at half the expense.

CONCUSSION AND PERCUSSION SHELLS.

Nearly three hundred concussion shells, the respective inventions of Captain Norton, Colonel Dansey and Mr. Marsh, have been forwarded to Portsmouth; they will be fired against the Swiftsure, but, in order to give them a fair trial, they should be kept for some months charged. It was at this test that the French concussion shells failed. We are happy to hear that some percussion shells will be fired at the same time, and a strong belief is entertained that this invention will this time succeed. It is strange that the officers forming the select committee should have decided against this, the "percussion" principle so clearly having the advantage over the "concussion;" not one of these officers are however known, either as scientific men or as particularly skilled in their profession, their opinion, therefore, carries no weight. In France some scientific men are always associated with the commission, and the result would really appear that our vessels may, in some future war with France, be destroyed with a missile rejected by our own unscientific board.

PURIFICATION OF SUGAR.

An invention has lately been patented for purifying our sugars, without the costly and expensive apparatus required in Mr. Howard's patent. The patent of Mr. Howard depended upon the ebullition at a lower temperature of the syrup by the removal of the pressure of the atmosphere, and Europeans only could be employed at it, on account of the necessarily complex machinery of the air pumps. The plan proposed by the patentee is to have a bath of solution of chloride of lime; this boils at 240° Fahrenheit. The syrup, by a peculiarly formed treddle, is agitated so as to present a thin sheet of heated syrup to the air, and evaporation is carried on, according to the patentee, at a rate equal if not superior to that afforded by Mr. Howard's patent. Indeed, to show the perfect command over the temperature by this treddle or wheel, by increasing its rapidity, the temperature from the greater evaporation immediately sinks. It is not, the patentee states, at all liable to get out of repair; and as the most expensive process in the manufacture of sugar is thus simplified, we may hope that this necessary article will, now the duty has been removed, be offered at a price most moderate. Should this plan be practicable, the most difficult part, requiring the constant attendance of Europeans, will be conducted at less than one-fourth of the present expense.

GALVANIZED IRON.

This patent is destroyed, the patentee having on a recent trial failed to support it. The ground on which he failed was, not having been sufficiently explicit in his specification. He claimed the melting of the zinc in an earthen vessel; this was clearly impracticable. He was forced to use iron, and though he fully substantiated his claim to the priority of the discovery, upon this apparently trifling cause he failed. Mr. Brand and Mr. Phillips were examined for the plaintiff.

STATUE OF PRINCE ALBERT.

It has been resolved to place a statue of Prince Albert in one of the corners of the New Royal Exchange, in commemoration of his Royal Highness having laid the first stone of that building. The funds are raised by subscriptions of merchants and mercantile houses, and public companies; the latter being restricted to £20 each, and the former to £2. We understand that the money has come pretty freely in, but that the Bank of England refused to subscribe. Mr. Lough is the fortunate artist fixed upon to execute the work.

MARQUETERIE.

The revival of a taste for antique furniture has drawn forth from many quarters an abundance of mere imitations in which, with a Chinese fidelity, all the imperfections of the originals are perpetuated. The demand for that elaborate kind of inlaying, known as *marqueterie*, has afforded opportunities for this imitative ambition, but few have had the courage to desert, even for the purpose of improving, their meagre prototypes. Among this few who have ventured, the house of Wilkinson, on Ludgate Hill, stands pre-eminent. They have recently completed some tables, of English design, in which, with the greatest success, the cold and straggling forms and imperfect colouring of the older specimens have been replaced by objects and tints which approach closely to nature. At the same time the stiff and singular structure of the old school have been succeeded by rich and graceful pillars and scrollwork. The description, however detailed, of their admirable workmanship would fail to convey any adequate idea of its superiority over that of the earlier artists. We have the greater satisfaction in calling attention to these productions, as we cannot but think it better that avowed living skill should be rewarded, than encouragement be afforded to *imposture*, by an injudicious search after the inferior manufactures of a bygone age.

A SMALL LOCK.

A.D. 1578. Mark Scaliot, a blacksmith of London, made a lock of iron, steel, and brass, of eleven several pieces, and a pipe-key, all which weighed but one grain of gold. He also made a chain of gold of forty-three links, which chain being fastened to the lock and key, and put about a flea's neck, the flea drew them with ease. Chain, key, lock and flea, weighed but one grain and a-half."—*Dr. Howell's History of England, published in the reign of Charles I.*

RAPID TRAVELLING.

A.D. 1620, July 17, Bernard Calvert, of Andover, rode from St. George's church in Southwark to Dover, from thence passed by barge to Calais in France, and from thence returned back to St. George's church the same day. This, his journey, he performed betwixt the hours of three in the morning and eight in the afternoon."—Ibid, page 460.

ROYAL GEOGRAPHICAL SOCIETY.

MONDAY, 10th February, R. J. Murchison, Esq., in the chair. The reading of Captain Haine's paper was not resumed, for though of great importance in regard to the navigation of the Red Sea, it was deemed fitter for reference and study, than perusal at the evening meeting.

The secretary read an account of an exploratory journey along the S. E. seaboard of South Australia, performed by Governer Grey, accompanied by Mr. Bonney the commissioner of public lands, Mr. Burr, the deputy surveyor-general, Mr. G. F. Angus, &c. The S. E. portion of South Australia was little known, it having been only traversed in one direction by overland parties, who passed through a country, for the most part of a very unpromising character, which induced the belief that the S. E. portion of the province offered little inducement to settlers; and that there was little probability of any continuous line of settlements being established between South Australia and New South Wales. It was in order, therefore, to effect a more minute examination of the country, that the governor undertook to explore it himself, accompanied by such persons as should make examination as effective as possible. The results of this journey were of the most satisfactory nature, and it was ascertained that, by keeping near the sea-coast instead of pursuing the line usually adopted, there is an almost uninterrupted tract of good country between the rivers Murrey and Glenelg. In some places this line of good country thins off to a narrow belt; in other portions of the route it widens out to a very considerable extent; and on approaching the boundaries of New South Wales, it forms one of the most extensive and continuous tracts of good country which is known to exist within the limits of South Australia. The S. E. extremity seems to have been the scene of recent volcanic action; some of the craters are filled with good fresh water, and are of great depth. A great advantage of this fine tract of country is its proximity to the sea. Along its coast are three bays, one of which has been found to afford good anchorage for small vessels, even in the winter season; and there is reason to believe that the others will also be found good for small vessels, particularly Lacepede bay. Thus affording great facility for a coasting-trade when the tract shall be settled. The transport by land with drays and carts can be carried on without the slightest difficulty; so that there is little doubt but that, ere long, there will be a line of settlements between Adelaide and Port Philip. Rivoli bay was regularly surveyed and its soundings laid down.

THE BRITISH INSTITUTION.

The annual exhibition of the works of British artists opened on the 10th ult. A new regulation has been adopted, excluding works which have been exhibited before; a regulation which whilst it has certainly conduced to give the attraction of novelty and variety to the walls, has not improved the intrinsic excellence of the display. More of mere mediocrity, and less of real merit, we have never seen brought together within these walls; an unprofitable field, therefore, for the critic's labours. True, there are some few names amongst the exhibitors which ensure admiration to whatever they may be attached, as Landseer, Stanfield, Etty, Inskipp, Martin, &c., and there are some few works which will enhance the reputation of names hitherto less accredited by the connoiseur public; but they are the exceptions and not the rule, and to them our remarks shall be almost confined, for we will not venture upon the vaster field of common place. Landseer has four of his " inimitable" imitations of animal life—" a Dog and Drake," a group of " king Charles's Spaniels," " a Suffolk Spaniel," and " a Retriever"—in all of which he astonishes us with the magic touch with which he clothes his " pets " with gaudy feather or silken fur, plump and soft, and almost warm as life. These are intensely admired by lovers of the "pretty," and not the less so because of the trick by which these effects are produced, (people like to be tricked even by a conjuror); a trick somewhat akin to that of the wood grainer, who will convert a deal board into one of oak, or mahogany, or rosewood, or even into a marble slab, *à volonté*. And the worst of all trick in art is that practice bringing with it increased facility and dexterity of hand which leads to haste,—a valuable consideration with most of us, the saving of time leading to the more rapid making of money, and in the end the superficial effects are produced in a manner which we very much doubt enduring long the wear and tear of time.

A similar haste and mannerism also we are sorry to see others of our popular artists falling into, as if to reward the public for their unbounded patronage and confidence. Stanfield is amongst this number; and Martin also, in two painfully glaring instances—his " Morning in Paradise " and " Evening in Paradise,"—two wide, cold, interminable vistas, with our first parents dabbed in, looking like two pale blueish-white leeches perched in unseemly prominence (unseemly, because anterior to the fig-leaf innovation) on the top of a hill in the foreground. Mr. Martin has never been successful with his figures, they are not his forte; but although individually he has not studied them much, and has cast them upon an extremely diminutive scale, when compared with his gigantic stage, he has generally brought them in in masses and groups so disposed as to heighten the sublime effect of his imagined landscape. In the two works before us, however, he has only introduced man to render him insignificant and contemptible as an item of creation.

As for Mr. Inskipp he lays it on so broad, sometimes so thick, sometimes so thin, that we can only imagine he paints with a very long brush or must be very shortsighted to reconcile himself to the rough dabbly superfices in which, viewed at the proper distances, he trusts for his effect. His female head—" La Cephaline," a pretty, intelligent portrait, is full of affectation of manner; the breadth of the red drapery, the jaunty blue patch of ribbon thrown in, between the whites of the head-dress, &c., all this is mannerism of colour, which this artist has in a hundred instances found successful, and will, therefore, no doubt, try a hundred times again. Another favourite study with Mr. Inskipp is all that pertains to the sports of the field, and here we have two of them, " the End of the Beat" (shooting), and " the Pike Fishers." It is certainly in this walk that this gentleman is most successful; the spots he selects are cool and rural retreats, inviting enough to a cockney looker on; his water, however produced, sparkles like water, when viewed at a respectful distance; his " gentlemen sportsmen" are " togged out" (that's the word we believe) as none else but Moses could do for them, and their equipments are perfect. There is a ruddy health about them too, which speaks of early rising, hearty breakfasting, and voracious dining; they show an intent eagerness after their sport also, which leaves no doubt of their being sportsmen to the back-bone; but withal there is a vulgarity of character about their whole appearance which somewhat annoys us, and makes us wish that the artist could have toned them down a little, or a *leetle* more in the background. In a word, there is no poetry about them. No more there is in the originals, it may be said. True. No more there is in an inn-yard, or the kitchen of a farm-house; but the province of art is to infuse poetry into whatever it touches.

The mention of this error of want of poetry leads us now to the works of another artist of celebrity, of whom, however, it must be said at the outset, that he is free from all the other sins of carelessness, mannerism, &c., which we complain of in the above-named. All Etty's work is an example of patient, careful, and successful finish. His flesh tints are as laboriously laid in now, as they were twenty or thirty years ago; his " modelling," to use a term adopted in French art, produces almost the effect of relief. But there is none of the poetry of the ideal about his figures, for there was probably none in the originals; and Mr. Etty, from long practice and devoted attention to his vocation at the Academy, cannot bring himself to attempt any thing beyond "an Academy figure," in which he is perfection.

Danby's "Gate of the Harem" is an instance of laborious finish, upon a subject in which is neither poetry nor beauty, nor any thing to interest. It is a dark reddish brown, tea-boardish-looking object, lighted up with occasional spots and dots here and there,—the result of an experiment (as explained in the catalogue) to portray "the full-orbed moon rising at sunset; the parting rays of the latter being reflected in the palace-windows. Some good-natured person told us that if we stood upon a chair we should discover endless beauties beneath the thick opaque, transparent surface; and we presume that it may be so, or Prince Albert, the head of the Fine Art Commission, would not have singled out this, and one other work, (excuse the solecism!) for purchase. So it is however, and this leads us to notice this one other work, which has met with so distinguished a patronage; as from the influential position which his Royal Highness holds in regard to the arts at the present moment, we may form a notion of the sort of thing we may expect to see in vogue under his auspices. "A Summer Afternoon," by J. D. Wingfield, represents the lawn of Hampton Court under circumstances suggested by the following lines in the Rape of the Lock:—

> "Here thou, great Anna! whom three realms obey,
> Dost sometimes counsel take,—and sometimes tea;
> Hither the heroes and the nymphs resort,
> To taste awhile the pleasures of a court."

A more insipid place than a court it would be impossible to conceive, if "the pleasures of a court" are done justice to in this performance, (and in this matter, if not in that of the other picture, we must assume his Royal Highness to be a competent judge,)—a party of ladies doing nothing in the extreme left foreground, and another little lady playing with a little dog and a blue sash (the ribbon of the Garter, perhaps,) in the middle-distance. The colouring of the picture is of a uniform flatness and coldness, which, being appropriate by analogy to the scene and subject, may perhaps be considered a merit. The same artist has another picture in this exhibition, which his Royal Hghness has not purchased, and we rather wonder at it, seeing that it represents, carefully reduced to scale, "the Cartoon Gallery" at Hampton Court, with the Cartoons and all complete, and some good people looking at them.

But we are growing bitter,—hateful weakness of the genus, critic! and we have this only consolation, that we know all we have said will produce very little effect, particularly upon those most concerned: *à quoi bon*, therefore, frowning and fussing, and finding fault? Let us quit the room in good-humour, by taking a glance at one or two little works which please us, and therefore must have merit.

"The Widow's Benefit Night," by Goodall, is a domestic scene in the Wilkie style, and reminds us somewhat of a very successful work exhibited by the same young artist last year, entitled "the French Wedding." Of the two works, we prefer the Irish scene; the grouping is better, the character more harmonious, and the colouring, though lively and brilliant enough, in better keeping. Not to attempt the abominable sin of describing or cataloguing the incidents in this picture, be it enough to say, that it includes dances, musicians, tipplers, gossippers, and every description of personage, old and young, which one might expect to meet on such an occasion; the figures and faces full of life and expression, and the finish of the whole admirable. The same artist has another picture, in a more poetic style, "the Soldier's Dream," illustrating Campbell's beautiful lines:—

"When reposing that night on my pallet of straw,
By the wolf-scaring faggot that guarded the slain,
At the dead of the night a sweet vision I saw,
And thrice ere the morning I dreamt it again."

It is a work of considerable merit, both in conception and execution, but we should hesitate to advise Mr. Goodall to abandon his other style for this more ambitious one.

Mr. Gambardella, in two pictures here, shows a happy talent for catching the expressive part of female beauty,—added to a completeness and *accord*, in regard of the features, with the grand secret of painting the "human face divine." His "Alice," a little thoughtful eye-speaking creature, we like the best; his "Two Pets," a larger work, is more voluptuous in idea, subject, and colouring, but with a lavishness in the last which might be a little subdued.

Müller (whose landscapes are rather too uniformly cold for our taste) has a clever little sketch for a larger picture, entitled "the Dance at Xanthus." The dancers, musicians, spectators and all, are full of character; and the tone is warm, yet not oppressive.

There are here and there some tolerable little landscapes, but we cannot add more particulars. The works of sculpture are only a dozen in number.

THE DRAMA.

The monotony which usually succeeds the Chrismas entertainments of the various theatres has been seasonably relieved by the appearance, at the Princess's Theatre, of two of the most brilliant stars of the United States, Mr. Forrest and Miss Cushman; of the former we have little to say, he comes not near our idea of a first-rate actor, nor will he leave behind him a favourable impression when he returns to a country better able to appreciate his powers and his peculiarities. But of Miss

Cushman, we can speak in terms of high eulogium. There are most of the qualifications which belong to a high order of dramatic talent exhibited in her delineation of those characters in which she has appeared before the public. She is remarkable for poetic feeling, graceful enunciation, and energetic manner. Though upon her first entrance on the stage there is less to prepossess than in most of the actresses who have won their way to popularity and fame, she soon acquires a power over the mind by the skilful display of her talents, and her intimate knowledge of the springs that move the human heart. The tragedy of Fazio is the work of a poetic mind of no ordinary character, and Bianca, in which Miss Cushman first appeared, affords ample opportunity for the display of tender love, of the gentler affections of woman, and also of jealousy and of those fierce passions which rack the frame. Under both circumstances, the acting of Miss Cushman is most effective, and produces the strongest influence upon her audience. Without possessing beauty of countenance, there is that intellectual expression which is beyond mere beauty, and without having a melodious voice, its intonations are rich and capable of conveying all those varied emotions which belong to high dramatic power. Her Emilia, on the night Forrest showed how little he was capable of estimating the requisites for Othello, was a chaste and powerful piece of acting such as has rarely been witnessed. Her Lady Macbeth we have not seen, but judging from what we have had placed before us, we have little hesitation in stating that we anticipate a better reading and performance of the character than that which has been shown by any actress since the days of Mrs. Siddons. Occasionally we have been reminded of Macready, but we think that this arises from some accidental resemblance in the features, for in no instance does she imitate him, and she is totally free from those marked peculiarities and mannerisms which unfortunately mar the efforts of a tragedian who certainly has great claims to the popularity he enjoys.

The French Theatre has thrown open its doors to the elegance and fashion of London, and gladly have the habituès of this charming resort availed themselves of the opportunity of welcoming Frederic Le Maitre in some of those highly melodramatic characters which have gained for him so much well deserved reputation. Although some of the rôles in which he appears may not be palatable to the fastidious critics of the morals of France, there is nothing that can offend the most delicate and most sensitive of minds in his manner nor in his expressions, nor can the delineations of the classes of society which he best paints, for one moment depress the tone of mind of those most alive to impressions. He is a skilful actor, and catches the living manners as they rise with fidelity and accuracy.

EXPLOSIONS IN COAL MINES.

The dreadful catastrophe at Haswell has not, we are happy to say, been allowed to pass unheeded. We have most gladly lent our humble aid to keep alive attention to the important matters connected with it. We have published such documents as have been from time to time brought forward by those who were called upon to give their most serious thoughts to the prevention of future calamity, and we now add one more Report. It is the result of the calm and cool deliberation of a committee of gentlemen connected with the coal trade, who have had practical experience in the management of mines—who have had before them opportunities of drawing inferences which should be on many points conclusive. The country is still most anxious on the subject; it requires to be satisfied that in future every precaution will be taken to prevent that fearful loss of life which has occurred, and it demands that it shall be clearly shewn that the avarice and cupidity of wealthy proprietors are not gratified at the expense of their fellow beings. If men are deriving enormous wealth from the toils and labours of others, they must carefully watch over the lives, the well being, and the comforts of those by whose means they wallow in the abundant luxuries by which they are surrounded.

We have no doubt that the committee from which this document emanates has laboriously investigated every matter submitted to its consideration, but has it sufficiently guarded against oblivion of the past, and a heedless following in the same career which has produced so much sorrow? Are the owners and officers of mines still to be permitted to have their own way, and is humanity always to be sacrificed to mammon? The government, loudly called upon to prevent catastrophes such as those which shocked the public mind, deputed two individuals, of the first rank in intellectual consideration, to inquire whether some remedies could be in future applied; the choice of Messrs. Faraday and Lyell was approved of by all. It is true, that it was well known that they could not have that immediate practical knowledge which such men as Mather and Dunn must necessarily possess, but they carried with them all those qualifications which science could give them; they were not locally connected with the mines, nor could they have any interested motives. It appears that the plan they have proposed for ventilating mines will not remedy the evil, and the committee has, in the document we now submit, explained the reasons by which it is led to differ from those gentlemen. We shall not at present discuss their objections—our limits will not allow us; but every member of that committee is imperatively called upon to devote the energies of his mind to the inquiry as to what can be effected. In fourteen years, there have been twelve great explosions in the Northumberland and Durham collieries; we say nothing of the frequent minor occurrences. Should there be a repetition of such lamentable events, the voice of humanity will be so loudly heard from one end of the kingdom to the other, that proprietors of coal mines will be somewhat astonished to learn the impression that exists. Much is said by the various parties about education, and whenever any untoward occurrence takes place, we are certain to hear a querulous cry about education for the working classes. What this education is to be, no one seems to agree about. If it is to consist of reading and writing, nothing can be more absurd, and though young ladies employed in factories in the United States may concoct a magazine, or write a sonnet about the moon, yet work very steadily, be exceeding virtuous, and very apt at the loom, it does not follow that orthography or syntax should be a part of a collier's education. It has pleased the Disposer of all events to give to some mental, to others physical powers; and this distribution seems necessary for carrying on the great system of human society. One class exerts its reason, the other its strength; they are mutually dependent, however, on each other. He who possesses the first of these endowments is enabled to avail himself of the gifts of the other class; but if he neglect the duties he owes to those he employs, not only is he the loser, but he deserves the reprobation of all the wise and the good. His first object must be to point out to the labourer what he has to do; then to fit him for the task; and lastly, to watch that he has all the assistance of which he may stand in need during its performance. The instruction required must be confined to the labours to be performed, besides that which teaches him his duties to his God, and to his brother man. All that is beyond this is little likely to increase the happiness of the working class, for wants and superfluities are only created. As well might the general require education for his soldiers before they go to battle, as the mill master for the operative, or the coal owner for the collier. If the question is, Who is to be educated?—our answer is, those who are the most ignorant;—those who are denominated the upper classes. Neither Messrs. Faraday and Lyell, nor the committee, have pointed out who the proper persons are who should be sent to school. We say it is the landed proprietor—the owner of the coal mine. He it is who should study—who should acquire that information which is to guide those whom he employs. His sole occupation is not to be to lavish with unsparing hand the gains produced by the hard labour—the exposure to pain and death of those who are working beneath the bowels of the earth; the owner has his duties to perform. He has to gain, from the intellectual pursuits of others, if he himself is too idle, the best means of turning to advantage his property, without sacrificing the lives of his dependents. A coal owner need not travel for information on the banks of the Danube, or seek novelty in Constantinople; he may find untiring occupation in the study of geology and chemistry upon his own estates; he need not boast the reception he gains from statesmen and from princes, when he may gather around him the most learned men of the age, who could instruct him upon points of the most value to him: he has sacred obligations to fulfil, which are better done at home, and he may scatter blessings around him where now are misery, sorrow, and dangers. As for schools for the "intellectual qualifications" of the workmen, such as are recommended, they are worse than useless. Make them good labourers, honest men, and grateful worshippers of their God, and they need neither pen and ink, nor flimsy books. Let them have a kind pastor, a good hearted viewer, and, above all, a proprietor who has a heart to feel, reason to guide him, and a conviction that he has duties to perform both to God and man.

REPORT OF SPECIAL COMMITTEE.

Coal Trade Office, Newcastle, Feb. 7, 1845.

While giving their anxious and impartial attention to the report of Messrs. Lyell and Faraday, on the subject of the late explosion at Haswell Colliery, and on the means therein suggested for preventing similar accidents, your committee have felt reason to congratulate themselves upon the qualified and judicious manner, with reference to practical considerations, in which these gentlemen advance their views and opinions. With some of these opinions your committee will, in the course of this Report, have the gratification to express their concurrence. If, with relation to others, they feel compelled to differ from Messrs. Lyell and Faraday, it will be found that the grounds of their dissent are freely, and, as they venture to hope, satisfactorily explained. Your committee are, indeed, persuaded, from the tone of candour which pervades the report of the eminent gentlemen to whom Government has confided the investigation of so difficult a subject, that had circumstances allowed them to acquire that amount of practical information which can only be gained by experience, their views would, in such case, have been in many respects greatly modified. The most important feature of the document under consideration consists of the description of an apparatus, the nature of which is fully detailed, and which, if adopted, is expected to have the effect of clearing the goaves of fire-damp, or of mixtures of common air and fire-damp, either entirely, or, at all events, to such an extent as to prevent an "underflow" into adjacent parts of the mine. It is, therefore, to this portion of the report that the attention of your committee has been chiefly directed. But allusion is also made to other points, of a more general and less prominent character, to which your committee feel the propriety of adverting, and some of these they will endeavour to dispose of before proceeding to the discussion of the principal subject. In reference to the expediency of making the upper seams the first in the order of working, it may be remarked, that such is a very usual practice, and where a contrary plan is adopted, the correct reason for doing so is given in the place cited, where it is observed that competition renders it indispensable to work out first the thicker and more valuable beds. The high main coal of the Tyne, a celebrated, though nearly exhausted seam, which, for many years, supplied almost exclusively the London market, is the uppermost of our series of coal beds, and was the first in the order of working. The Bensham seam, which is noted for the quantity of fire-damp yielded by it, and in which the most calamitous explosions of the district have occurred, has since been extensively worked beneath those tracts where the high main coal is already excavated. As regards fire-damp, the natural inference plainly is, that a coal-field is most efficiently drained of this mischievous agent, by first working those portions of it where the gas is most abundant, that is, as a general rule, its deepest portions; but without going into this, at present, perhaps, unnecessary inquiry, your committee have to state that they entirely coincide with the conclusions to be drawn from the report of Messrs. Lyell and Faraday, that the utmost will be made of the private property of mine owners which the nature of each case admits—that the interests of individuals and of the country are thus fortunately the same, and that a capitalist will gladly avail himself of the privilege of winning, at a less amount of outlay, an upper, and therefore more accessible seam of coal, provided that, by doing so, he can compete successfully[a]. Your committee agree in the observation that ventilation is of the utmost importance, and that there is a practical limit to the sinking of shafts; " for to dig shaft after shaft would quickly involve an expense more than the value of the produce of the mine, and have the effect of closing it altogether." Of the limit thus assigned, an instance is furnished in what occurred at the first attempt to win Haswell

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[a] Your committee have found that, in practice, upper seams are very little injured by the working of under seams first, even where a few fathoms only intervene. When a general subsidence of the strata takes place, in consequence of the removal of an underlying bed of coal, this subsidence lowers a corresponding portion of an upper seam, but does not injure it materially; because, the upper bed being entire, its disintegration is prevented by the circumstance that one portion of it supports and prevents the displacement of another. The committee must, therefore, be permitted to say, that, in their opinion, which is grounded upon experience, little, if any, coal is " lost to the country," by the actual methods of working practised in the counties of Northumberland and Durham.

Colliery, in a situation not far distant from the site of the late explosion. The "sand," which, in many places, underlies the magnesian limestone, was there found to be nineteen fathoms thick. It was penetrated to the depth of eight fathoms and a half, and water-feeders were for some time contended with, by means of heavy machinery, to the extent of fully 4,000 gallons per minute—a quantity adequate to supply the wants of five large towns, each containing 115,000 inhabitants, at a rate, including the allowance for manufactories, steam engines, &c., of ten gallons per day for each person. After persevering for a considerable time, the owners were compelled, at an enormous sacrifice, to abandon the design of sinking their pits in the place alluded to. And this must not be taken for a solitary example. At the Murton Pits, four miles from Haswell, even greater difficulties were encountered. Although the sand there was only about a fourth of its thickness at Haswell, the water-feeders were nearly 8,000 gallons per minute, and, in order to force a passage, the owners were compelled to apply machinery to the extent of more than 1,200 horse power. It is, therefore, manifest, that an obligation to sink additional shafts would have the effect of closing some mines now in full operation, and yielding even the most valuable description of coal. It may also be observed, that as the shafts of a mine bear a very small proportion to the entire length of its air-passages, it is by the condition, as regards number and extension of the latter, that the aggregate volume of air in circulation is mainly regulated. By enlarging the section of the air-channels, and by dividing or "splitting" the air—a practice which is now universal—the ventilating power of the shafts is brought into full exercise, and these arrangements, when combined with shafts, as now sunk, of larger sectional area, and with more powerful ventilating furnaces than in past times, have, in point of fact, realized the effect of additional pits, by shortening the run of the respective air-currents, and by assigning to each current the duty of ventilating a much smaller space of mine than formerly. Your committee allude, with great satisfaction, to the improvements just mentioned, which, in conjunction with other arrangements of a more detailed and practical nature, have more than trebled the quantity of air circulating in the mines of this district. Much has, therefore, been done towards security, so far as that object is to be gained by a more complete system of ventilation, and it is gratifying to find that, with the progress of time, alterations are being made, not of a crude or imperfect nature, but really sound and beneficial in their character. Having thus adverted to some preliminary points, with the satisfaction of finding that the practice of the district has been in unison with Messrs. Lyell and Faraday, as expressed in their report, your committee will proceed to remark upon the most important topic discussed by those gentlemen—being that which relates to the ventilation of the goaves. Some misconception appears to have arisen as to the extent of goaves, which, in point of fact, are not limited in their dimensions even by an area of 100 acres, but ultimately come, by the continued progress of the pillar excavations, to be co-extensive with the tract of coal-field which is being worked. It thus happens that there will be a greater or less magnitude of goaf, corresponding with the length of time a mine has been in operation, and with the quantity of coal extracted from it; and that, at last, the mine will consist exclusively of goaf in that seam the coal of which has been entirely removed; such, in fact, being already the case with several old collieries. It must further be remarked, that there is not any certainty of an open communication between one part of a goaf and another part of the same goaf; the contrary is, indeed, the rule, in almost every case, as may easily be understood from the following considerations. The immediate effect of the removal of a pillar of coal is to produce a fall from the roof, or bed of stone, resting upon the coal; and the cavity made by this fall of stone is necessarily of a conical form—the base being that of the coal excavated, and the height that at which the superincumbent strata receive support from the sloping sides of the cone. As the coal continues to be removed, the sides lose their support—the cone is extended; and the process goes on until the superimposed strata, no longer sustained by the converging sides of the cone, subside, and rest upon the broken fragments of the fallen stones, which occupy a much larger space than did the same rocks when in a solid state. The summit of the cone does not then continue to extend upwards; but, as the excavation progresses, the strata rest upon the mass of stones forming the goaf; and the upper portion of the goaf becomes nearly horizontal, or parallel with the lines of stratification. This is proved by the state of upper beds of coal, a few fathoms above the lower bed which has been already extracted. It is found that irregular subsidences have taken place, that the breaks in the strata are not very numerous, nor of the character of fallen fragments, but are similar to small slip-dyks, showing the subsidence of extensive areas at once. Under these circumstances, it cannot but be obvious that in some parts the fallen mass must be crushed extremely close, and that, in others, cavities may exist; the effect produced being, in fact, that of rendering the interior either, practically speaking, solid, or of dividing it into compartments, which are isolated from each other. It must not be supposed that after the completion of the process just noticed, a passage will still remain open at the sides of the goaf; on the contrary, the unworked pillars do not stop the progress of the general subsidence in that direction, save in particular and exceptional cases; and the circumstance itself constitutes a difference between a subsidence of the upper beds and an ordinary fall of fragments from them—in which latter state the Meadows goaf was seen, as your committee understand, by Messrs. Lyell and Faraday. When a general subsidence takes place, as before described, the line of fracture extends in a direction receding from the goaf, and therefore overhanging the standing pillars; whence it follows, that the ruins of the overlying beds, between the fracture and the goaf, abut, or are jammed against the sides of those pillars. Your committee trust that the description just given will show with sufficient clearness what is really the nature of a goaf; and that, in this ultimate state, its vacuities are either replaced by the subsidence of the upper strata, or, where cavities are contained in it, they are far from being necessarily in communication with each other; but, on the contrary, the inference to be drawn from observation, and by deduction, is, that they are isolated and detached. Thus gas is often to be found, not only at the rise edge of a goaf, but at its deep extremity, and along the lateral portions extending between the two. Your committee, therefore, submit, that an apparatus of the nature described, if placed at the upper edge of a goaf, could not be depended upon as draining it throughout its entire space; because there is not any certainty of a communication for the passage of gas to a fixed point at a distance. Hence, a very extended system of drainage would be required; and, in fact, it would be necessary, in order to ensure success in the operation, to have a separate apparatus at each avenue leading into the goaf—since an underflow of the goaf atmosphere might occur at any opening into the waste or into the working districts, supposing the inflammable gas to be incapable, as before explained, of making its way through the obstacles opposed to its naturally ascending tendency. Further, to carry out, at Haswell Colliery, the first plan proposed—that of conducting the gaseous contents of the goaves to the upcast shaft, by means of cast-iron pipes, twelve inches in diameter, and half an inch thick in the shell; assuming each of the fourteen goaves throughout the mine to be supplied with a distinct main—would require rather more than twelve miles of pipes, and would cost, including the putting of the latter together, about £21,000, if not considerably more; perhaps even double this sum, considering the difficulty of laying down such a length of pipes in the workings of a mine, and the unprecedented nature of the operation. And this calculation, it must be recollected, is based on the supposition, that each goaf has only one pipe; whereas it has been shewn that a great number of branches, at the least, in connexion with the respective mains, would be required for every goaf in the mine. As relates to the current expense of maintaining the pipes, your committee cannot venture to name any precise amount: they would, however, remark, that they can anticipate the extreme difficulty, if not impracticability, of keeping the goaf ends of the pipes in working condition, and that a fracture there, which is so likely to occur, would destroy the entire value of the apparatus. It may likewise be apprehended, that to keep such long ranges of pipes in thorough repair, and air-tight, especially in those most important parts of the range which are near the goaves, and where consequently the roof and floor of the mine are in motion, would be not only most troublesome and expensive, but scarcely, they believe, practicable. Moreover, the constant attention which would be required to keep in order the goaf terminations of the several ranges, must, without doubt, in so dangerous a situation, be attended with risk of frequent loss of life, from falls of the broken strata. The second plan, by which it is proposed to discharge the contents of the goaf into some adjacent portion of the return air-courses, may be considered as superseding that part of the expensive character of the project which consists in an extension of the pipes to the upcast shaft. Still, in point of fact, the goaf termini, which would, in that case, remain as before, are the most embarrassing parts of the proposed arrangement: the same multiplied form of the apparatus would be there required—the same constant liability to derangement would exist; together with all that amount of complexity and difficulty which your committee have endeavoured to explain. but which can be fully appreciated by those only who are intimately conversant with the nature of underground operations. Your committee, perceiving so many obstacles to be overcome in the execution of a project to which, nevertheless, they feel bound to give their candid consideration, have, not unnaturally, endeavoured to bring past experience to bear, as a test of the practical value, in relation to the saving of life, of a plan for clearing the goaves of fire-damp, supposing such a plan to be as successful as the projectors could anticipate. The committee accordingly find, that during the last fourteen years, there have occurred, exclusively of the Haswell accident, eleven great explosions in the Northumberland and Durham Collieries; and that these have happened, with perhaps one exception—though that one is of a doubtful character—where the respective mines were being worked in the whole—that is, in those parts where pillar-working had not yet been commenced. It is, therefore, clear that, in at least ten cases out of eleven, during the period in question, the goaves have had no connexion with the origin of these accidents. Neither is this fact of difficult explanation; for goaves, guarded as they are by safety lamps, and having distinct currents of air passing their gaseous contents into the return air-courses, where no naked lights are allowed to enter, must be considered, and are proved by experience to be, the least mischievous districts of a mine, as relates to explosion. An allusion is made to the state of the barometer, as connected with occasional sudden and temporary discharges of gas from the goaves. To this cause its due importance must be allowed. No circumstance, indeed, is better known than the influence of atmospheric pressure upon the condition of mines, as regards fire-damp and choke-damp; and it may also be remarked, that the range of the barometer is sensibly greater in deep mines than at the surface. This instrument ought, therefore, to be attended to, with a view to greater vigilance, and the adoption of increased measures of security, should such be required, when the mercury falls, and more particularly when its depression is sudden. But, it must also be recollected, that the danger thus pointed out is one of those which are provided against by an active ventilation, and that an agent is thus constantly employed in preventing accumulation, by removing whatever extra portion of gaseous or inflammable product may enter the mine when the atmospheric pressure is diminished[a]. The sudden issue of large quantities of fiery atmosphere, by reason of heavy falls of stone taking place in the interior of goaves, constitutes, your committee apprehend, the principal source of danger in pillar-working. Yet they cannot perceive that the plan proposed by Messrs. Lyell and Faraday would remedy this evil. If the goaf end of the pipe were inserted to the height of four or five feet above the top of the seam, all the goaf space at a higher level than the summit of the pipe would remain unoperated upon, and its gaseous contents would still be liable to dislodgement and issue from the cause assigned. Thus the danger which is chiefly to be dreaded would not be obviated by the adoption, if this were practicable, of the apparatus recommended. It will not be out of place to notice here the result of an investigation into the state of Haswell goaves since the explosion. In consequence of reports arising, not unnaturally, out of the recent accident, that portions of the mine were in an unsafe condition, a close examination has lately been made, by a deputation of the pitmen of that colliery, into the state of its goaves, and of the Meadows goaf in particular, as regards fire-damp. Four days were employed in this scrutiny, an account of which is given in a report of the deputation, published in the local newspapers, and signed George Wilson, George Summerson, William Hall, and Ralph Wheatman, hewers, employed at the colliery. With a view to greater precision, your committee applied to the parties just named, for a statement of the heights above the coal seam, at which they had tested, with their safety lamps, the condition of the respective goaves, and received from them an answer, which, along with the original report, is given in the appendix. It appears from these documents, that no gas was detected in any of the fourteen goaves of the Haswell mine, even up to the heights extending from five feet to thirteen feet above the top of the coal seam, at the highest edges of the several goaves. Your committee entertain no doubt whatever of the accuracy of these observations. The presence of an inflammable atmosphere would, of course, have shown itself, by filling the gauze cylinder of the lamp with flame; but, besides this obvious effect, pitmen are very well acquainted with the appearance caused by different mixtures of air and fire-damp upon flame, and can thus judge of the presence of inflammable gas, in proportions much below those required for explosion. Besides, a deputation from your committee have been enabled to verify the statements in question, by investigating the condition of the Haswell goaves, and by bringing away portions of their gaseous contents for examination, and in no case did they find that an inflammable mixture was contained in the receiver, which was brought from the goaves, in the manner alluded to. More especially, air from the upper edge of the Meadows goaf, thirteen feet above the top of the seam, shewed no trace of fire-damp. When the goaves were thus examined, the barometer was at 29.27: according to an observation made a few minutes before the explosion of the 28th September last, it was then at 29.85. Your committee are well aware that the goaves of many collieries are not equally free from fire-damp with those of Haswell; but that, on the contrary, inflammable gas constantly exists, in considerable quantities, in the goaves of some mines, where the evolution of fire-damp is much greater than in Haswell. Your committee have, however, shown that the actual state of goaves is incompatible with that required for the efficient working of the apparatus suggested by Messrs. Lyell and Faraday; and having also duly considered and explained the extreme difficulties, expense, and almost, in their opinion, impracticability, of carrying into execution the plan recommended by those gentlemen, together with the extreme uncertainty of its success, they regret exceedingly that they cannot recommend it for adoption. Towards the conclusion of the Report, a hope is expressed "that some step may be taken without delay, with a view to afford a better education to the persons engaged in working in collieries;" and it is mentioned that "at the late inquest, more than half of the pitmen who gave evidence, some of them persons of great intelligence, and one master wasteman, were unable to write, or even to sign their names as witnesses."[a] The schools of mines, and scientific establishments of France and Germany, are also referred to, in proof of the careful manner in which professional persons, of different grades, are there instructed in those branches of knowledge which are there connected with the art of mining; though the committee will take leave to remark, that they apprehend the mining practice in those countries is in no respect superior to that of Great Britain. It is quite correct that the officers of mines are, in this district, chosen from amongst the most intelligent and best informed of the pitmen themselves, even up to a high rank; and this is a boon of which that meritorious class of men are well deserving, and which your committee believe they do not enjoy in foreign countries. It must, however, be remembered, that the subordinate officers in question are not the responsible managers of mines. Their occupation is entirely of a practical nature; and your committee have found from experience that intelligent men of this class, knowing that their prospects in life depended upon assiduous attention to their duty, are the most to be depended upon for carrying into full and perfect execution the orders of their superiors. Your committee are duly impressed with the value of education to every class of the community; and they believe that at almost all the collieries schools are patronized by the owners, and that increasing care is bestowed upon the education of the workmen. They, therefore, cordially rciprocate the opinion of Messrs. Lyell and Faraday, that every attention should be paid to the improvement of the intellectual qualifications of those to whom any superintendence is entrusted. In the concluding paragraph of the Report it is said, " there are here no conflicting interests to contend with, for the proprietors are always anxious to prevent explosions and accidents, not only by their feelings of humanity, but by a regard to the property they have at stake; while the viewers, under-viewers, and other officers, are continually risking their own lives, and sharing every danger with the men." With this statement, and more particularly with the tone in which it is expressed, your committee, in common, they are sure, with all other members of the trade, entirely concur. Much good, it is hoped, may be done, when the attention of eminent men is directed towards the prevention of pit explosions. The trade is deeply indebted to Messrs. Lyell and Faraday for the labour and consideration they have bestowed towards the attainment of this desirable end; and your committee trust that those gentlemen will not give up the investigation of a subject in relation to which, when its intricate practical difficulties come to be fully appreciated by them, their eminent acquirements may prove highly beneficial.

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[a] A careful comparison has been made of registered barometric observations, with the accidents which have happened since the year 1805. The result is, that of twenty-three great explosions during the period in question, twelve have occurred when the mercury was either steady or rising, and eleven when it was falling. Several have happened when it was about thirty inches, and one only when it was below twenty-nine inches; but, the actual height is obviously of less consequence than the relative one, as compared with that which immediately preceded the respective explosions. The results just stated go to shew, generally, that ventilation of the customary degree of efficiency, is a safeguard against the danger arising from fluctuations of the barometer.

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[a] This, it may be observed, is a misapprehension as relates to the case of the master wasteman, who is not only able to write his name, but is in reality a man of some general reading. The committee may here take occasion to remark, that the variable terms applied to the description of strata, in different parts of the kingdom, have often proved inconvenient and embarrassing, even to practical men; and it is therefore extremely desirable, as recommended in the report, that some uniform mode of designation should be adopted. The local phraseology is, however, well understood in the different districts, and is often more significant of the working qualities than of the mineralogical or geological character of the strata. It is evident that a nomenclature, unless adopted universally, would not be attended with the advantageous results contemplated. Your committee, however, are of opinion, that every assistance and encouragement should be given by the mining interests of this district towards the establishment of a general nomenclature descriptive of the coal formation.

GEORGE JOHNSON, CHAIRMAN.

Such is the report; still are we of opinion that things must not be left as they are; another explosion, attended with loss of life, will meet with severe and honest inquiry.

SMITH'S PATENT WIRE ROPE.

TO THE EDITOR OF THE POLYTECHNIC REVIEW AND MAGAZINE.

SIR—I beg that you will be pleased to insert in your scientific Review and Magazine the accompanying drawings and descriptive illustrations of the advantages of my patent wire rope over that made of Russian hemp. The accompanying five sketches show the different kinds of round wire rope that I manufacture, and their different formation, along with the tabular scales, showing the difference between wire rope, hempen rope, and chain, as regards size, weight, and price, and also a table showing the comparative merits between hemp and wire rope as applied as standing rigging for the whole of her Majesty's ships in commission. You are no doubt well aware that of all materials yet known, iron wire, in proportion to its weight and size, possesses by far the greatest strength or tenacity. This is produced in consequence of the important change the material undergoes in transforming it from a "rod" into a "wire," by means of annealing in a close retort, heated by charcoal, and repeated in proportion to the number of "holes" through which the wire is "drawn," or its reduction in size from its commencement, when it is of about three-eighths of an inch diameter to about "No. sixteen wire gauze," or one-sixteenth of an inch diameter, by which means it becomes thirty-six times longer than it originally was when a "rod," and relatively about three times stronger, or, in other words, it possesses three times its former tenacity. In fact, it has become a new kind of material, as it is changed from a crystallized mass to that of a tough fibrous material. Thus there is an immense increase of strength produced from the processes of manufacture, and nature seems to have set scarcely any limit to the quantity of raw material, as we possess sufficient of it in this country to supply all the known world.

It is upwards of ten years since I brought this invention forward; my first patent is dated 12th January, 1835. The dogged and stupid opposition offered to its introduction at first was surprising. I have had the mortification many times of being told by gentlemen belonging to the royal navy that it "would never answer, and that they should not like to be on board of any ship rigged with wire rope."

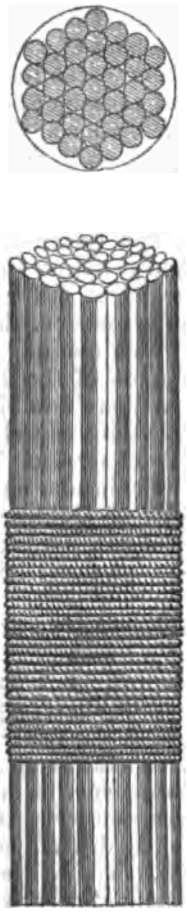
What a pity it is that those gentlemen are not made better acquainted with the properties of materials, particularly before they are either instructed with the command of a ship or have the dictum at an Admiralty Board. How much improvement has been kept back by the obstinacy of those gentlemen, and how much our navy has suffered in consequence. The fact is, as regards the wire rope, it is now used for more purposes than hempen rope can be used for; such as suspension bridges, of which I have built several, and they answer an exceeding good purpose, and are much cheaper and easier of construction than chain bridges; besides, I have invented and successfully carried out an important improvement in the construction of suspension bridges by means of wire rope, that the lateral motion is entirely prevented, which motion, or lateral strain, has been the distinction of most of the suspension bridges. A great many ships in the navy are now rigged with my wire rope, and her Majesty's royal yacht, as well as a considerable number of ships in the merchant service. The whole of the large steamers belonging to the Peninsular and Oriental Companies, as well as those of the City of Dublin Company, are fitted up with my rope; in fact, it is now used for capstan ropes, equal to 18-inch hemp, down to the finest line, instead of cat-gut for time-pieces, &c.

As I before said, I have, Mr. Editor, sent you drawings of five different kinds of round wire rope, for which I have obtained letters patent: I will in as concise a manner as I possibly can explain the construction and properties of these ropes. You will perceive that each rope is composed of exactly the same number of wires, and each wire is exactly the same size; and in order to illustrate to you that in consequence of the different formations of rope, the different sizes and weights are produced, and that the rigidity and pliability depend entirely on the density, figures 1, 2, 3, 4, and 5, as I before said, are composed exactly of the same size and quantity of wire.

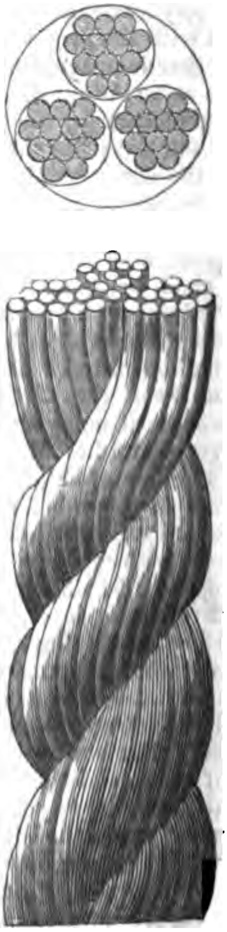
No. 1 is what is technically termed a "selvage rope;" the wires are laid perfectly straight and parallel to each other; hence the most dense and strongest in proportion for its size and weight, but which is at the expense of pliability, and thus best calculated for the standing rigging of ships. This rope is not above one-third the size of hemp, and about one-half the weight for equal strength, and about one-third cheaper, first cost. It is the strongest rope made, and is stronger than a solid bar of iron of the same size, and its proportion to No. 2 is as 14 to 17 as to size and weight for equal strength.

No. 2, is what is termed " a three-stranded hawser ; it is more pliable than No. 1, which is obtained by an increase of size and weight as 17 is to 14, and answers very well for

No. 1.



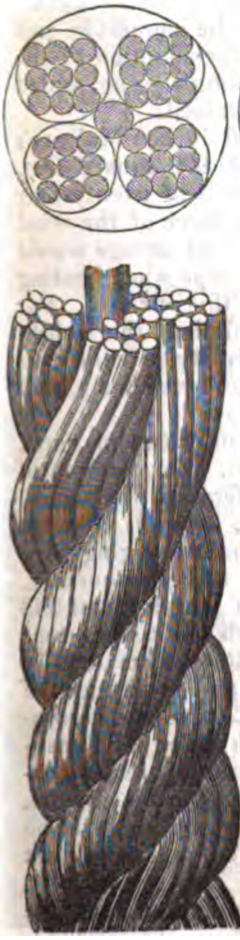
No. 2.



winding purposes when the drums are large; it is next in strength to a "selvage rope," and the strongest rope of the hawser kind.

No. 3, is what is termed a "four-stranded hawser;" it is more pliable than No. 2, in consequence of being obliged to have a *core* or *heart* in the centre, in order to keep the four strands in their proper position. It must be observed that this core or heart does not add any thing to the strength in consequence of being in a *perfect straight line*, whereas the four strands are in a helical or circular line, and measures about one-eighth longer than the core or heart; consequently, before any strain is felt upon the strands, the core or heart is generally broken. It bears a proportion to No. 2 as 18 is to 17, in size and weight for equal strength.

No. 3.



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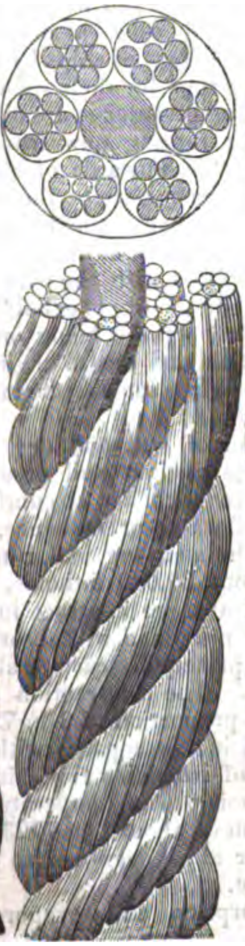
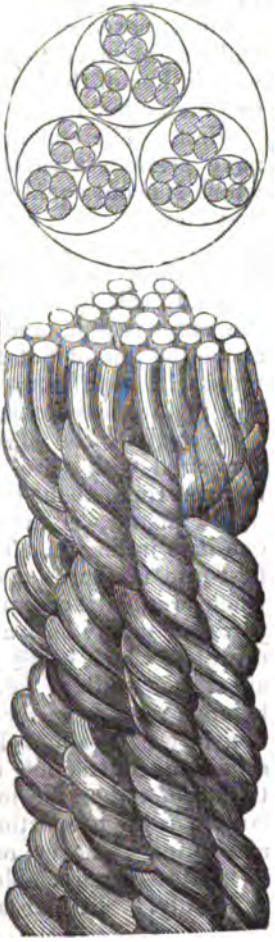


No. 5.



No. 4, is what is termed a "six-stranded hawser," and is more pliable than No. 3, in consequence of having seven hempen cores or hearts; this pliability is of course obtained at an immense sacrifice of strength, in consequence of those cores or hearts being in a straight line, while the six strands are in a helical or circular line, similar to No. 3. About one-third of this rope has at first to bear the whole strain, until the hearts or cores are broken, then the weight will come upon the six strands; this will be easily seen to be the worst arrangement possible. This rope bears in proportion to No. 3, as 20 is to 18, to size and weight for equal strength.

No. 5, is what is called a "cablet three-stranded hawser rope," laid together; it is the most pliable rope made, and is composed of nine strands. Before chains were invented for cables, this was the kind of rope used for that purpose. It bears a proportion to No. 4 as 22 is to 20, in size and weight for equal strength.

The annexed tabular scale shows at once the amount in cost and weight saved to each class of ships by the adoption of the wire in lieu of the hemp rope for their standing rigging, added to which other important advantages are obtained.

First. The standing rigging now fitted in her Majesty's navy presents a surface of upwards of 800,000 square feet, which is about equal to the surface of the sails of twenty-four first-class frigates; and allowing the mean force of the wind to be 1½ lb. to each square foot, an immense advantage would be obtained to vessels fitted with the wire rope when beating to windward, by presenting only one half this surface. For the same reason, and also there being only half the weight above the line of flotation and centre of gravity, a ship thus fitted will stand better to her canvass, be more weatherly, and will require less ballast.

Secondly. The effect of wet and dry on hempen rope, compared with wire, is distinct and great. One fathom of hempen rope, about three inches in circumference, will absorb half a pound weight of water or moisture, and will contract one inch in length. The standing and running rigging of a first-rate measures about 30,000 fathoms, and consequently, when wet, will on an average contract in length about 833 yards, or nearly half a mile, and will absorb about seven tons of water, which being principally carried aloft will materially affect her sailing, &c. The contraction and expansion of hempen rope is in the proportion of 1 in 72, and the absorption in weight about 1 in 4, compared with which the expansion and contraction of iron wire rope, in the greatest extremes of either the moisture or temperature of this climate, is only in the proportion of about 1 in 1723; and there is no absorption whatever, or at all events of so trifling an amount as not to be appreciable.

Thirdly. The absorption and evaporation of moisture

A TABLE shewing the comparative merits between Hemp and Wire Rope as applied to the different Class Ships of Her Majesty's Navy, as regards Price, Weight and Size, the strength of each as proved both by the Testing Machine and by experience, being equal.

HEMPEN ROPE £40 Per Ton.								WIRE ROPE £60 Per Ton.									
Class of Ships.	No.	Average weight per Ship.		Total Average.		Total Cost.		Class.	No.	Average weight per Ship.		Total Average.		Total Average.		Total Saving.	
Guns.	Tons.	Tons	Cwt.	Tons	Cwt.	£	s.			Tons	Cwt.	Tons	Cwt.	£	s.	£.	s.
120	12	30	0	360	0	14,400	0	120	12	15	0	180	0	10,800	0	3,600	0
80	18	28	6	509	8	20,376	0	80	18	14	3	254	14	15,282	0	5,090	0
74	11	27	0	279	0	11,880	0	74	11	13	10	148	10	8,910	0	2,970	0
50	6	28	10	171	0	6,840	0	50	6	14	5	85	10	5,130	0	1,710	0
46	9	15	0	155	0	5,400	0	46	9	7	10	67	10	4,050	0	1,350	0
28	22	12	16	273	12	10,944	0	28	22	6	8	136	16	8,208	0	2,736	0
18	36	12	0	432	0	17,280	0	18	36	6	0	216	0	12,960	0	4,320	0
10	36	3	5	117	0	4,680	0	10	36	1	12½	58	10	3,510	0	1,170	0
Schooner	13	2	5	29	5	1,170	0	...	13	1	2½	14	12½	877	10	292	10
Cutters.........	47	2	0	94	0	3,760	0	...	47	1	0	47	0	2,820	0	940	0
Steamers	62	2	10	155	0	6,200	0	...	62	1	5	77	10	4,650	0	1,550	0
Transports ...	50	4	10	225	0	9,000	0	...	50	2	5	112	10	6,750	0	2,250	0
Lighters	50	1	4	60	0	2,400	0	...	50	0	12	30	0	1,800	0	600	0
	376					114,330	0		376					85,747	10	28,582	10

exercise a powerful and destructive effect upon all vegetable substances, and however much these may be guarded against, still the effect of time, which cannot be guarded against, is destructive and insidious; whereas the only enemy iron has to contend with is oxidation, which, besides being easily prevented, only exerts a proportionate pernicious effect, bearing about the same ratio which exists between the expansion and contraction of hemp and wire rope. The wire rope, therefore, as standing rigging, possesses the advantage of saving the expense and trouble of frequent "setting," and besides the diminished first cost, will wear out several suits of hempen standing rigging, but how many it is not yet possible to say, as the "Marshall," the first ship fitted with it, has had the same suit in use for the last nine years, and when last surveyed was pronounced to be nearly, if not quite, in as good, sound, and serviceable a condition as when first fitted.

The calculation may be taken thus—half the weight, one-third the size, and about half the expence, and being in an inexhaustible supply in our own country.

ANDREW SMITH.

THE NEW GLASS MOSAICS.

MR. DICKSEE has exhibited specimens at the soirées of most of the scientific institutions of the metropolis of his patent Mosaics, which have likewise been approved by the Royal Commission on Fine Arts; and as Mosaic decorations are becoming so popular, in consequence of the attention bestowed upon the subject by the Royal Commission on Fine Arts, some notice of this new and beautiful description of Mosaic will be interesting.

The material employed is glass, and the method of producing the tesseræ is by a process of moulding by pressure. For this purpose a small machine is used, from which the tesseræ are produced of all shapes and sizes, perfectly formed, at a rapid rate and trifling cost.

The superiority of glass to pottery, and all substances used for Mosaic purposes, has been universally admitted; but the immense cost of its manufacture into the required forms by the old methods has prevented its universal adoption.

Glass, as a material, is cheap; and the patentee is of opinion that when the duty is removed, he will be able to compete with pottery in price.

Glass excels all other materials employed for mosaic purposes, inasmuch as it can be obtained of any colour, or tone of colour, to suit the light in which it is to be used. It is imperishable, and will never corrode. It may be used with the fire polish natural to it, or the surface may be dulled or polished.

Should the surface get scratched, the dirt will easily wash out; —such is not the case with porcelain or marble.

It combines all the effects that can be produced in all other mosaic materials; and the most costly marbles, pebbles, &c., are imitated with precision, and at no more cost than the plain colours. These imitations, when formed into slabs for table-tops, &c., have a most beautiful effect. Another description, which is applicable to mural decorations, is that with figures pressed upon the surface, the figures may be of different colour to the ground, and the surface may be coated with transparent glass, to make it even, and preserve the figures from dust.

ON THE CONNEXION OF PYROGEN WITH CARBONIC, NITRIC, MURIATIC, PHOSPHORIC, AND OTHER ACIDS.

By John Joseph Lake.

Pyrogen enters into the composition of carbonic acid, which may be generated by the passage of a current of the former from charcoal; that is, carbon, points. By this means the oxygen of the atmosphere unites with the carbon, which has the greatest possible affinity for it, when pyrogen is present in motion. Latent pyrogen, however, does not appear to produce this effect; it must be in a state of circulation or movement.

The strong affinity between carbon, oxygen, and pyrogen, under these conditions, is in part the cause of heat in the bodies of warm-blooded animals. The necessary motion or circulation of pyrogen is caused by the inflation of the lungs, and various chemical compositions and decompositions taking place in the stomach and elsewhere. In reference to the former, when the lungs are inflated, the chest is larger and fuller than when they are in the opposite state; consequently, as inspiration proceeds, a current of pyrogen flows up the body, and as the blood is a better conductor than the solid matter of the body, as the water in a well is better than the soil through which the well is sunk, it follows that this current flows principally, if not altogether, by the veins to the lungs, where part is absorbed in forming carbonic acid, in which operation a certain degree of heat is generated, and the remainder urged by its repulsive principle to the surface[a], from which it passes with the moisture from the body into the atmosphere as the lungs contract[b]. The pyrogen would ascend by the surface of the body but for this better conductor.

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[a] Polytechnic Rev., May 1844, p. 263.—January 1845, p. 11.

[b] Chambers's Cyclopedia, Art. *Perspiration.*—Polytechnic Rev., November 1844, p. 328.

When pyrogen thus raised meets with the air drawn into the lungs, the oxygen leaves the nitrogen, and combining with the carbon in the blood forms carbonic acid, which is respired.

The other cause of the heat of the blood is the circulation of the pyrogen, which generates or developes heat when in motion[a]. To the same cause may be attributed the comparative warmth of the month of November, which is said to result from the condensation of the vapours prevailing at that season into rain, &c.; for when this operation takes place pyrogen is set in motion[b].

Carbonic acid can be dissolved by the abstraction of pyrogen from it, by exhibiting to it other substances which have a greater affinity for the latter. When carbonate of ammonia is employed in producing an amalgam of the bases of ammonia and mercury, there is a most decided decomposition of this acid and formation of carbonaceous matter[c].

Pyrogen also enters into the composition of nitric acid, which is produced on passing sparks or discharges of it through atmospheric air. It is true that the quantity to be obtained in this manner is, with great labour, very small; yet it is sufficient to prove the fact of its production.

By analysis, pyrogen may be obtained from nitric acid, by using a solution of the latter in the experiments detailed in a former paper on this subject[d]; also from muriatic, phosphoric, and many other acids.

My own researches extend no further than this; but some of the experiments made by others, which I have not had leisure to repeat, afford many interesting facts which illustrate and confirm the correctness of my views on the subject of pyrogen. Some of these form the subject of the following paper.

ON THE NATURE OF OZONE.

By John Joseph Lake.

Though it may not be strictly legitimate investigation on my part to adopt the experiments of others, yet as the repetition or nonrepetition of them by me cannot be of the least consequence to the reader, or give them any increased authority or importance, and as they may not prove altogether without interest, I would here briefly refer to some made by Professor Schönbein[a] and Mr. Gann[b], to ascertain the nature and properties of an odour, with which electricians are well acquainted, which is produced by pyrogen, and by the working of an ordinary machine in the air, besides various other ways which will appear as we proceed. And it will be seen in how remarkable a manner these experiments confirm my views as to the nature and properties of pyrogen.

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[a] Polytech. Rev., February 1845.

[b] Polytech. Rev., Nov. 1844, p. 328.

[c] Sir H. Davy's "Electro-chemical Researches on the decomposition of the Earths, with observations on the metal obtained from the Alkaline Earths, and on the Amalgam procured from Ammonia."—Philosophic Trans. 1808.

[d] Polytech. Rev., January 1845, p. 7, and see April 1844, p. 227.

M. Schönbein first drew attention to the subject at the meeting of the British Association in 1840. He considered this odour to be due to the presence of a hitherto unnoticed substance, which he named ozone. It is evolved only at the anode or positive pole on the decomposition of water, dilute sulphuric acid, solutions of phosphoric and nitric acid, potassa and many oxysalts; dilute sulphuric acid yielding it in the greatest quantity. It is also to be obtained from atmospheric air under certain conditions, oxygen, nitrogen, hydrogen, carbonic acid, and nitrous oxide.

M. Schönbein could only procure it with platina and gold electrodes; but Mr. Gann obtained it when these were of copper, iron, silver, zinc, charcoal, and plumbago, whether the electrodes were both of the same metals or of dissimilar, except zinc. If both electrodes were of this metal, ozone was not perceptible; yet when copper, iron, silver, or platina were positive and zinc negative it was developed. Not so, however, when these arrangements were reversed. The cause of this would seem to be that the elements of which zinc is composed are partly decompounded, and the ozone enters into combination with some or all of them; for it would appear that this metal is not a simple substance, from the colour of the flame on the combustion produced by the decomposition of the acid solution used in some former experiments[c], which was purple when it was used at the negative electrode; whereas the flame resulting from the combustion of oxygen, hydrogen, and pyrogen is blueish, as when platina electrodes were used. This purple colour can only be ascribed to some decomposition of the zinc. A similar result was produced when copper and iron electrodes were employed instead of zinc, and it is to be surmised from the same cause; for when, in the experiments referred to[d], iron electrodes were used, a reddish flame was produced, and though copper electrodes did not change the colour of the flame, still, on account of its preventing the evolution of ozone, it is most probable that some unperceived chemical action takes place upon its elements.

Ozone was obtained by Mr. Gann when oxygen, nitrogen, hydrogen, carbonic acid, and nitrous oxide were used as well as atmospheric air[a]; but when either the positive or negative electrode was of zinc, a peculiar scent was produced in nitrogen and hydrogen. From which it may again be inferred that zinc is not a simple substance, and that the peculiar scent arises from the combination of some of its elements with ozone; though this scent may result in part from the decomposition of these gases at the same time; for the greatest doubts are thrown over the simple nature of nitrogen[b], and even hydrogen is liable to the same through this experiment. It would, indeed, seem the necessary inference from Mr. Gann's experiments, that oxygen enters into the composition of nitrogen and hydrogen; for ozone was developed, except in these two instances, from oxygen and its compounds, by the combination of oxygen with pyrogen, and hence it would follow that nitrogen and hydrogen contain oxygen.

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[a] Proceedings of the British Assoc., 1840. Athenæum, 1840, p. 742.

[b] Proceedings of London Electrical Society, 1841—2, p. 160.

[c] Polytech. Rev., January 1845, p. 8.

This conclusion is much supported by the following considerations. Ozone is developed only at the positive electrode with oxygen, and is obtained from oxygen and its compounds. The cases in which it is produced in nitrogen and hydrogen are referred to above, and the difficulty considered; but it may be well here to add that hydrogen is always developed at the negative electrode, but ozone never. Professor Schönbein also observed some of its electric effects, which shew that pyrogen enters into its composition. He found that "when perfectly clean and dry plates of platinum are immersed in oxygen containing ozone, they acquire a negatively electric state of polarity; silver and copper also become thus electric, but in a far less degree than gold or platinum. The plates thus polarised retain their electric powers in air for a considerable time, but rapidly lose it when plunged into hydrogen gas, in which, if retained a sufficient time, they acquire an opposite state, becoming positively polarised." He also informs us that a plate of gold or platinum charged by exposure to an electric or pyrogenic brush, "is perfectly similar in its electrical powers to a plate charged or polarised by immersion in oxygen containing ozone," and that "heat or exposure to hydrogen, which destroys or inverts the electricity of such a plate, exerts a precisely similar action on plates polarised by exposure to the brush."

With boxwood and gas charcoal at the positive electrode in a solution of sulphuric acid, ozone did not appear; but carbonic acid was formed, which resulted from the strong affinity between oxygen and carbon, when pyrogen, in an active state, is present. This prevented the formation of ozone.

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[a] The method he adopted to obtain Ozone was, by passing the electrodes through a closely fitting cork into a jar of atmospheric air, or of any of the gasses above mentioned.

[b] Polytech. Rev., November, 1844, p. 349.

With a solution of muriate of soda ozone was not perceptible, until the gas obtained from platinum electrodes at the positive pole was placed over ammonia and water to absorb the chlorine. The residual gas emitted the odour of ozone.

Mr. Gann having obtained gas from voltaic action with platina electrodes placed in a solution of sulphuric acid and water, and filled several jars with each electrode, preserved them over water. Two measures of this hydrogen and one of the ozone being passed into an indiometer and exploded over mercury, there was no residual gas nor any odour remaining, the ozone disappearing in the formation of the water consequent upon the explosion.

Mr. Gann does not notice, like Professor Schönbein, that mercury and water are great absorbents of ozone, though it may be perceived from his own experiments; for oxygen gas, procured by him as above, which had been secured four days in a jar, was introduced into the idiometer over mercury, and thirty-five discharges from a Leyden jar passed through it; on examination the odour of ozone had entirely disappeared. A portion of the oxygen thus collected was also passed into an idiometer over water, and forty discharges passed through it; no odour remained, but the original gas still retained the odo.

HISTORY AND PROSPECTS OF BRITISH ART.

Patronage of British Art, An Historical Sketch, comprising an Account of the Rise and Progress of Art and Artists in London, from the beginning of the reign of George the Second, &c. By John Pye. *Longman and Co.* 1845.

"Patronage of British Art!"—is not the title a misnomer? "Patronage!"—"British Art!"—where and what are they? That we have canvass-painters, and marble-cutters amongst us, and that we have purchasers of painted canvass, and hewn marbles also, we do not deny; but generally speaking, what do these works exhibit of art, save its purely manipulative part? Where is the divine genius, of which art, purely so called, should be the willing and obedient servant. Where the noble themes which this genius, so aided and attended should put before us? In all that relates to these two essentials we are just as miserably off as we were seventy-five years ago, when Barry, that starveling of genius, was about to return from Italy, and poured out his misgivings at the dreary prospect before him in such words as these:—"I go over," he says, "with poor hopes, and I think a melancholy prospect enough; yet this arises rather from my fears about the state of the public than from the knowledge I have of myself. I shall say nothing about the catalogues of fish, flesh, fowls, fruits, roses, snuffers of the moon, &c., which have lately been produced in your exhibitions. I have seen them all lately, and begin now to think that I have taken the wrong end in my studies, and that the antiques and old Italians are more sought after from their characters, which are upon record, than from any real feeling of their excellence:.......... oh! I could be happy, on my going home, to find some corner where I could sit down, in the middle of my studies, books, and casts after the antique, to paint this work and others, where I might have models of nature when necessary; bread and soup, and a coat to cover me. I should care not what became of my work when it was done; but I reflect with horror upon such a fellow as I am, and with such a kind of art in London, with house-rent to pay, duns to follow me, and employers to look for. Had I studied art in another manner, more accommodated to the nation, there would be no dread of this; but Hussey's fate is before me!"

"Hussey's fate is before me." What was Hussey's fate? His sad story is thus related by Mr. Pye:—"Whilst the English were caressing and enriching Van Lov (the portrait painter), Giles Hussey, a young Englishman, highly accomplished as an artist both by nature and education, returned from studying in Italy, to develope in his native land an ideal world of grandeur and beauty. But, as the wealthy English generally had not learned to recognize genius in art, until the testimony of Europe, or the interest of some dealer, had put upon it the stamp of celebrity, Hussey, on arriving in London, found his great professional attainments useless, and was, consequently driven, (as he used to say) to the drudgery of painting portraits as a means of subsistence. In the pursuit of that uncongenial employment, the originality of his mind, which ordinary men could not well appreciate, exposed him to much illiberality; and, having contended with adverse circumstances till he imbibed disgust for the world, he retired to the country to repose on the protection of a brother. Hussey's drawings left at Bologna, notwithstanding that old ones are continually being removed to make room for superior merit, are still preserved there, and shewn for their excellence; and a picture he painted of Bacchus and Ariadne, for the Duke of Northumberland, is still at Sion House."

The Duke of Northumberland is entitled to honourable notoriety as the only fashionable patron of poor Hussey; but as an illustration of the total ignorance of the true purposes of art, under which those most desirous to encourage it laboured in those days, we quote the following anecdote from Barry:—"In a conversation," he says, "I once had with the Duke of Northumberland (who was Hussey's friend and patron,) his

Grace told me, as a matter which he could not account for, that he had once proposed to Mr. Hussey, as employment which he thought would be perfectly agreeable, to make drawings, large as the originals, of all the celebrated antique statues, and that Hussey refused. I could not help observing to the Duke, that I was not surprised at Mr. Hussey's declining such a proposal; that it was to be expected from a man who had been forming himself (together with other studies) upon those antiques, in order to acquire abilities for the production of other and original works, in which opportunities might occur of disputing for the palm of excellence with those very antiques themselves. The Duke seemed to feel what I said respecting this excellent man, and in a manner that did his Grace great honour, expressed much regret that he had not thought of some other way of employing his abilities, and that Hussey himself was much to blame in not pointing out some undertaking which might meet both their wishes."

The Duke's notion of art, like that of too many of his followers, did not go beyond its mere imitative powers. He admired the antique statues because the general voice of public opinion told him to do so; but he did not consider that in setting an artist of genius to copy them, he was, after all, inflicting the drudgery of portrait-painting upon him—drudgery even more humiliating than that of painting the horses, babies, or lap-dogs of nobility—inasmuch as the originals in the latter case are forms of living nature, whereas in the former they are cold stone.

Barry wrote, in 1761, that he dreaded the fate of Hussey; and how truly was his apprehension verified! After struggling for years, in penury, for an opportunity to make the high purpose of his adopted art felt and known amongst his countrymen[a], he at length, in 1777, is permitted to undertake the painting of the walls of the great room of the Society of Arts, *gratuitously*, with a contingent reward in the proceeds of an exhibition of his work during a limited space of time in one year! Poor Barry expresses his joy and "gratitude to God" for even this opportunity of employing his pencil, in his letter to the dilettanti society, in language which would almost make one smile, but that it would more make one weep to reflect upon the deep and accustomed humiliation which could bring "patient merit" to rush upon so forlorn a hope. He then proceeds to tell us that, "in July, 1777, I began the work, although I was without patron, fortune, or encouragement, without wages ('wages' of historical art, when the merest clerk in the Bank, or letter-sorter in the post-office talks of his 'salary!') to subsist on, and with no other assistance to carry it on than what I was able to derive from any other occasional works which might fall in my way."

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[a] "When I was at Rome," says Barry, "Abbé Winckleman, the Pope's Antiquary, published a History of Art, which gave great offence to many of our people, as it contained very severe reflections upon the character of the English, charging them with the want of capacity and genius to succeed in the superior exertions of the arts of painting, &c., and that their practice demonstrated that they were fitted for nothing greater than portraits and other low matters, from whence no honour could be derived either to the artist or to the country. Abbé Winckleman having in this matter only gleaned after Abbé Du Bos and the President Montesquieu, these injurious opinions were become the common creed of the greatest part of the dilettanti. . . . . . . It appeared to me that the setting of these matters in their true point of light, would be an undertaking not unbecoming an artist, and from whence some little credit might be derived; I was ready enough to flatter myself that the doing of this had been fortunately reserved for me; and accordingly, soon after my return from Italy, I took the liberty of humbly presenting his majesty, (as the first fruits of his academy,) with my inquiry into the real and imaginary obstructions to the acquisition of the Arts in England," &c. His majesty, however, took no notice either of the book or its author.

For seven long and dreary years, with the sole companionship of his lofty genius, with the sole encouragement of his noble and devoted purpose of raising, not himself, but the character of the arts of his country, did Barry labour at this self-imposed task. "He has been heard to say," his biography tells us, "that at the time of his undertaking this work at the Adelphi he had only sixteen shillings in his pocket, and that in the prosecution of his labour he had often, after painting all day, to sketch or engrave at night some design for the print-sellers, which was to supply him with the means for his frugal subsistence." During all this time, no lordling dilettante went near the starving lunatic, not even to present his noble person as a fit model for introduction into the picture, as royal and noble patrons, from the time of Charles the First downwards have been in the habit of doing.

At length the great work, illustrative of the progress and fruits of "human culture," was finished, and Barry received as his reward the proceeds of two exhibitions, amounting to £503, besides 250 guineas and a gold medal, handsomely voted him by the society. Barry afterwards endeavoured to raise a subscription for the publication of prints from his great work, but with very poor success.

At length, in the words of an anonymous writer, "Barry, after a life of struggle, disappointment, and poverty, was compelled to drink off the cup of sorrow and humiliation to its last dregs, and to submit to have his name advertised as an object for a public subscription, in the hope of obtaining for his wants and grey hairs that shelter which was refused to his merits. Sad, indeed, must have been the necessity which wrung from his proud heart an assent to that last deplorable shift of misfortune. But even there the evil genius of historical painting pursued him, and he lived just long enough to endure the whole weight of the misfortune, but died too soon to receive a single shilling of the sum subscribed."

But Hussey and Barry were not solitary instances of the habitual neglect in which native and living genius has been treated in this country. Gainsborough and Wilson, whose names now stand in the highest rank in our catalogues, and whose works now fetch large prices, got more cuffs than halfpence for their pains in their life-time*. Even Sir Joshua Reynolds could only get on with his countrymen as a portrait painter. All his principal historical and fancy pictures were painted for, or purchased by, foreigners—the Empress of Russia, Prince Potemkin, Count d'Ademar, M. de Calonne, and others. It is recorded "that George the Third saw, during the first eight years of his reign, in the annual exhibition, a succession of the finest pictures by Reynolds, Gainsborough, and Wilson, without being induced to give a commission to either of them;" and that, during those eight years, his Majesty never honoured Reynolds with an interview. West stood alone amongst British artists, as enjoying the advantage of royal employment. During thirty years, from 1769 to 1801, this artist received £34,187 from the royal purse.

Meantime, whilst the fate of Hussey, Barry, Wilson, and Gainsborough showed the worth, or rather worthlessness of the patronage of the great, Hogarth, by resorting to engravings, and by the success which attended his experiment, showed that the true and valuable patronage of art must come from the many. Man is a gregarious and timid animal, in matters of taste, as well as matters of domestic concern. Alone and unsupported, there are few men who will venture to applaud the work of a new candidate, but with multitudes, the spark of genius catches the fancy unawares, is roused into a flame by contact, and the whisper of praise, which the individual critic would have suffered to die half uttered upon his lips, rather than run the risk of committing himself, swells into a sonorous body of public applause. We do not say that the public voice is always discriminative, much less just, in its allotment of praise. To be so, it must be possessed of a refined taste, and an adequate knowledge of art; but this it does: it expresses its opinion—it awards praise and rewards. We have here the secret of the advantages and the dangers of the system of public exhibitions, and we perceive at once the importance of the public taste being educated upon good models, in order that it may give just judgment.

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* Wright, in his life of Wilson, says, "He was frequently under the necessity of selling his pictures to brokers for whatever trifling sums he could procure. There was in St. James's parish, a person who, being hard pressed by Wilson to give a small sum for one of his pictures, led the artist up to an attic, opened the door, and pointing to a pile of pictures against the wall, said, "Dick, I wish to oblige you; but look, there's all the stock I paid you for these three years!" Again, "There was in Long Acre, a shoemaker, whose shop had two windows, in one of which he placed the articles of his regular trade, and very frequently in the other a landscape, by Wilson. And it is generally believed, that pictures thus parted with for a few pounds, have since been sold for hundreds."

And this, after all, is a charming and blessed necessity of liberal art; this mutual dependence and reciprocating influence between it and the multitude—the "*profanum vulgus*" of the courtly Horace. It is a modern discovery in music, that a multitude of voices shouting in concert, even though their voices be not all in tune, produce by their amalgamation a musical sound, deeper and more sublime than the most ravishing note of an Italian cantatrice. So also in the multitude of hearts and impulses are truth and power the grand objects of art: and thus it is that the arts of the country are the offspring of the public voice, and so also do we demand, that as of old with the Greeks, so now with us, the works of art, or at least the enjoyment of them, should be the property of the public. We are told on the authority of Pliny, that "In Greece there was a time when the works of art of great masters were not considered as common moveables, destined to embellish the apartments of private persons, but were looked upon as public treasure—jewels of the state—the enjoyment of which was due to all the inhabitants." Let our great collectors—our Sutherlands, our Westminsters, and others who imprison the works of art, which fortune has thrown into their hands, in dungeons to which none but a golden key can admit the friendly eye of sympathy and admiration, reflect upon these words, and repent of the evil they have done; of the breach of trust of which they have been guilty. Let them throw open their prison gates, within which models of excellence have so long been immured, and they will do more to improve and encourage the arts of this country than a thousand competitions of crudities such as we have recently seen under the patronage of a Royal commission.

Mr. Pye, whose interesting volume has suggested many of the above reflections, devotes a considerable portion of his attention to the history of the few institutions devoted to the interests of the fine arts which this country possesses, particularly the Royal Academy, and the Artists' Fund Society. And here again it appears clearly that the term "patronage," as implying the favour and support of the great, is a misnomer as regards British art. All that has been achieved for art has been achieved by artists themselves, supported by the public at large; and some of the wholesome effects of this has been rather marred than otherwise by the intervention of the illustrious. It appears clearly that exhibitions of pictures were originally adopted by the artists as a body, the proceeds being appropriated to the general advantage of the exhibitants and their families: that two exhibiting societies existed from 1760 to 1769, when, upon some disagreement amongst the members of one of them, Royal patronage stepped forward to found the

Royal Academy, upon the exclusive principles which it still acts upon, the general body of artists contributing to its funds by the exhibition of their works, whilst the proceeds are appropriated almost exclusively to the advantage of the members of the academy, who are restricted in number. Mr. Pye gives a general summary of the results of his researches on these points in his introduction :—

"1. That the establishment of exhibitions in 1760-62 gave life to British artists as a community, and that the sixpences and shillings of the million (which eventually proved to be a mine of wealth) constituted its support;

"2. That when the artists had thus become united by a common interest, the helpless among them became the first object of their care, as a community, and the promotion of the arts the second;

"3. That the members of the two societies, established in 1760 and 1762, possessed equal rights in the society to which they each respectively belonged;

"4. That some of the leading members in the more numerous and influential of the two societies, having resisted the will of the majority of the community, and sought to usurp perpetual power in its government, that majority united, in 1768, for the protection of their common interests, and ejected from office those persons who, whilst holding power in trust, sought to exercise it as though it were their own.

"Some of the most distinguished of the body, thus discomfited, were then enabled to connect the arts with the crown by the establishment of the Royal Academy, of which, as has been already shewn, an annual exhibition formed a prominent feature, and, ultimately, a most productive source of revenue, notwithstanding the repeated declaration, that the Academy was 'supported by Royal munificence.'

"But this revenue, it is to be remembered, was not obtained by the exhibition of the works of the members of the Academy alone, in fair competition with the exhibitions of the other societies, but mainly by enacting that, as a qualification for the mere chance of obtaining the countenance of the crown through academic honours, all candidates must send their works to the exhibition of the Royal Academy, and not exhibit with any other society of artists in London. This condition amounted to the absolute sacrifice, by the aspirant, of all profit accruing from the exhibition of his own works; but, from the desire which an artist naturally feels that the stamp of Royal patronage and official sanction should be set upon his pretensions, the original societies were gradually abandoned by their most distinguished members, in the hope of attaining the honours which Royal munificence otherwise denied them; and hence the founders of the new Academy at last acquired that control over the entire profits of exhibitions which they had long struggled for, but were unable to reach, while presiding over a society resting upon a representative basis.

"Hence, as the Academy rose, and the original societies sunk, the monument they had raised to humanity in the fund for protecting the superannuated, the widow, and the orphan, above the degradation of pauperism, sunk also, and was so completely forgotten, that even those members of the Academy who recorded its origin and progress, made no mention of such a fund having existed, and, of course, no apology for its having been destroyed.

"From 1780, the exhibition of the Royal Academy stood alone; and, at the beginning of the present century, its exhibitors amounted to 505, of which number only 36 belonged to the Academy, so that the remaining 469—with the exception of those who happened to have private fortunes to rest upon—were exposed to the possible occurrence of those very evils from which it was the aim of the Society of 1762 to protect the community of British artists, by the mode in which its revenue was appropriated.

"The Academy, indeed, in its acquisition of this revenue, had established a charitable fund of its own; but petitions for aid from that fund must of necessity stigmatise the applicant at once and for ever as a pauper, even although he might have sacrificed to the Academy's revenue the profits of exhibiting the works of a professional life, whilst tasting, by the way, the bitterness of disappointed hopes, and struggling (perhaps but too vainly) to preserve to himself the dignity of mental independence. And this stigma would be fixed upon him in a country in which even the appearance of wealth is virtue, and the acknowledgment of poverty vice."

The amount of income thus lost to the general body of exhibitors may be judged of from the fact that, up to 1773, the receipts of the Society of Artists amounted annually to from 700*l.* to 1,200*l.*, and those of the Free Society to between 100*l.* and 200*l.*, and that these societies shortly both fell to the ground under the monopolizing influence of the Royal Academy. The altered position in which the artists of England now found themselves led eventually to the foundation of the Artists' Fund of Provident Care, the history of which, as well as that of the Benevolent Fund, is given in considerable detail by Mr. Pye.

It is not our intention at present to enter upon the question of how much the Royal Academy has done for the Arts in return for the monopoly of shillings and of Royal patronage which they enjoy, nor will we enter upon the wider question as to what would be the most advisable course for the promotion of the Arts in this country; these questions may form the subject of a future article, for the present we shall merely confine ourselves to a little statement of figures afforded us by Mr. Pye, from which we gain a notion of the aggregate income of the Academy during a series of years, and the general heads of their outlay:—

Mr. Edwards, in his Letter to Sir Martin Archer Shee on the Reform of the Royal Academy, (1839, printed for Private Circulation), states that The average receipts of the exhibition, amounted, up to 1836, to about 5,000*l.* a-year (since its removal to the new gallery they are understood to have very greatly increased); and the total amount of revenue received by the Academy since its first establishment, up to the same period, to about 260,000*l.* It is to be regretted that no annual accounts have ever been published of the disposal of this revenue; but, as nearly as the evidence affords data for its calculation, it may be stated as follows:—

	1. As Assembly of Honour.			
1,	In official salaries necessary to this function ..	about	£28,000	
2,	annual dinner to the patrons of art, &c. ..	"	20,000	
3,	pensions to members and their families....	"	12,000	
4,	miscellaneous expenses	"	6,800	
				£66,800
	2. Schools.			
5,	In official salaries to keeper, professors, &c. ..	about	36,500	
6,	other expenses	"	36,000	
7,	travelling students	"	4,500	
				77,000
	3. Exhibition.			
8,	In expenses of exhibition (including committee of arrangement)	about	45,000	
9,	In benevolent fund for exhibitors, being non-members	"	20,000	
				65,000
				£208,000
10,	Funded property, for continuance of pensions to Academicians, &c.			52,000
		Total ..	about	£260,800

In this statement we would only call attention to these items: 20,000*l.* for feasting the patrons of art (that is of portrait painters), against 20,000*l.* for benevolent purposes, and only 4,500*l.* for travelling students.

Mr. Pye complains of the exclusion of engravers from the honours of the Academy, which was denounced at the time by Sir Robert Strange, and other eminent engravers, and refers to the more liberal and just association of the kindred art at Paris, St. Petersburgh, and other foreign cities. This question, however, is also one upon which we cannot touch further than to draw attention to it. We have only, in conclusion, to add that Mr. Pye's volume appears to have been compiled with great diligence, is agreeably written, and deserves the attention of all who take an interest in the arts of their country.

ON THE NAVAL ARCHITECTURE OF SIR W. SYMONDS.

There is no subject more important to a maritime nation than that to which the recent discussions in the House of Commons have lately given rise; our existence as a nation depends upon our naval superiority, and that has been hitherto maintained as much by the excellent construction of our ships as by the bravery and skill of our seamen; the bare supposition that those splendid vessels, built regardless of cost, launched with so much parade, are valueless, fitted but to become prizes,—if such, according to the criticizers of Sir W. Symonds, miserable specimens of naval architecture could ever deserve such a name,—demands from its importance a searching investigation.

The vessels respecting the construction of which there is at present so much distrust have been built upon the lines and the forms laid down by Sir W. Symonds. The talent of this officer is unquestioned, and the practice his situation has afforded him, joined to but slight study, should be a guarantee that the vessels now building are not worse than those formerly in service. It would have been easy to have selected the best known sailing vessels as a model, and to have, as occasion offered, tried gradually those alterations which might have been expected to improve our navy; it would have been at least a measure of precaution to any careful person, where thousands of the public money were at stake, to have submitted the theory to some scientific Board, before extensively adopting it into practice; but we cannot hear that this has been done, and the Surveyor of the Navy has thus exposed himself to the charge of rashness and an undue reliance upon his own judgment: if the vessels built upon his own unaided judgment were faultless, this might be passed unheeded, but in every vessel it is alleged that the same defects are apparent,—that of bad steerage, deep immersion, and pitchings in a rough sea; it is found by experience that whenever a vessel pitches, she loses way in strong winds; the vessels of Sir W. Symonds are observed, probably from this cause, to have but little speed. The Royal steam yacht would, however, appear to be a concentration of Sir W. Symonds's errors; scarcely a week passes without some account of the repairs and alterations to which this unhappy vessel has to be submitted, every one of which appears to be attended with no other result than bringing prominently forward its defects.

When first this steamer bore its royal charge to the coast of France, the reports, though from their quarter to be viewed with suspicion, were extremely favourable; her rate of speed was reckoned as superior to any yet attained, though on that occasion her swiftness was not tested by any steamer of known capability. But, from a strange want of care, the fittings were secured with the marine glue of Mr. Jefferys; this, as our readers are aware, is composed of India-rubber and shellac softened with naphtha, and the effluvia from this glue is of a most disagreeable character; the mechanics when applying it complain frequently of headache, and the scent appears, like the smell of the camphor wood, to become inherent wherever it is applied; for after several months' exposure we have observed it, when submitted to heat, emit the same disagreeable effluvia. Though this would be a ridiculous cause of complaint for our hardy sailors, yet to persons so completely unused to such inconveniences as the royal party must have been, a more intolerable nuisance could scarcely have been devised. In vain Eau de Cologne and every scent was tried, the naphtha smell overpowered all. Now, the slightest acquaintance with the subject would have guarded against this fault, and great surprise must have been felt by the authorities at the Admiralty that her Majesty should have been submitted to an inconvenience to which the commonest person would not have been subjected. Trifling as this omission may appear, it materially influences confidence, and every charge against Sir W. Symonds meets with ready credence for the glaring error exhibited; and though but to remedy an inconvenience, it necessitated the entire refitting of the steam apparatus, which has never worked so well since. The presence of a scientific man upon the Board would have at once prevented this; or had it been even deemed advisable to employ this valuable glue, he would have pointed out that by the use of sulphuric ether or spirit of wine, at but a trifling expense, to dissolve it, instead of naphtha, no disagreeable effluvia would have been perceived.

The Royal Albert and Victoria yacht has been marked by certain defects, the principal of which has been a wild steerage; at any great speed, the vessel turns without the slightest attention to her rudder, and the war steamers built to her unfortunate form have the same fault to a much greater extent. With them, indeed, it is universally admitted that a serious error has been committed in addition to their wild steerage; they pitch and roll to an extent which would render them entirely unfit for the merchant service, and they are not able to bear near the armament for which they were intended. A few years back one of our war steamers was actually fired into by a French frigate, and a seaman severely wounded, her wild steerage giving the French commander the idea that the steamer would run him down. The Royal yacht was from this cause, during her late trip, forced to adopt the slow rate of five miles an hour. It was urged that this tedious travelling was from the crowded state of the Channel, but as other steamers found no difficulty in preserving their usual speed, it is evident that where the slightest difficulty of steerage presents itself, the Royal Victoria and Albert yacht cannot be depended upon except at this diminished speed. All the ships built by Sir W. Symonds are distinguished by a peculiar taper form from side to side; by this, and narrowing the stern, he considers he gives an increased facility for cutting through the water; now this form is undoubtedly the cause of the wild steerage of his ships, and certainly does not obtain any increased speed, for the rate of the Royal yacht was, during the last journey, tested by steamers of different companies, and was found decidedly inferior to three. This is itself a most humiliating fact; the Royal yacht was built solely for speed; the comfort of numerous passengers did not require, as in the Great Western, to be consulted, the carriage of merchandise not being required, as the yacht could, if wanted, draw her provisions from the vessels of war accompanying her; there was no need of study for her stowage. One object only was required, and that was speed, to effect which the Surveyor of the Navy was left perfectly unfettered, and the lamentable failure which, in despite of the thousands lavished upon her, this vessel has proved, renders it clear that the principles adopted by Sir W. Symonds are erroneous; but though all his steam vessels are alike defective, we do not find that the assistance of scientific men has been called in by Government.

In constructing our sailing vessels, the same fatality would appear to have attended his unfortunate theory; every vessel draws more water than was required or calculated on. This is a necessary fault of Sir W. Symonds's wedge-like construction, which is open to the most serious objection, as it renders at once valueless the great advantages which could otherwise be derived on particular services from the employment of small vessels; brigs can be employed in water where large vessels would be stranded, and as the brigs constructed upon this form draw nearly as much water as our frigates, we should find most serious inconvenience either in chasing or in being chased. The same fault in three-decked vessels is even more serious; the lower deck guns could not be worked at all in rough or unfavourable weather, and a vessel of the line would be at once reduced to the level of a frigate. These glaring faults have at last been reported to the Admiralty, and a trial was made between a brig constructed by Sir W. Symonds and others built by different shipwrights. The Surveyor of the Navy has, however, the advantage of the best hands; he can select the best wood, he has experience in the build of vessels of war, and the brig built had the defects noticed in a much smaller degree; but, notwithstanding these advantages, he was beat in every trial by the Daring, a vessel built by Mr. White, and that so indifferently as to be dangerous from her continued leakage. The vessel built by the College was certainly as bad a specimen as could have been imagined, but if we are to credit the reports of the Portsmouth papers, the trial, though so unfavourable to the Surveyor of the Navy, was one by no means free from objection; the vessels were not fairly laden, nor were the crews impartially selected.

The Admiralty have since determined, by experiments, to ascertain the shape by which the greatest speed can be obtained consistent with strength, and as the British Association have directed their attention to the same point, we may hope now for better results, and that being without forts, our floating bulwarks, on which we alone trust, may again deserve the flag they bear. Though the experiments of the British Association, unassisted by government, have necessarily been upon a very small scale, their report is well worthy the consideration of the Admiralty and Sir W. Symonds, but the question is far more complicated than that commonly submitted. It is not what form opposes the least resistance to its transmission through the water; that a few simple experiments would determine; but with what armament and what draught of water; and the error of the Surveyor of the Navy, with every one of the vessels in this respect is surprising, as the most trifling experience and the slightest acquaintance with hydrostatics would be a sufficient guard; the buoyant power of the air is easily estimated, the specific gravity of the wood is taken in a few seconds, and this, with the rules laid down in the works on ship-building, would lead most certainly to a correct estimate. But, as in the introduction of a fetid cement, the Surveyor of the Royal Navy would appear entirely independent of rules or of the ordinary calculations which would be made in the merchant, or, indeed, in any but the government service. These considerations of armament, &c., greatly embarrass the question. If it was only which vessel could sail the swiftest, the Mystery yacht would be the best form, though totally unadapted for the rough seas over which the royal standard must float, and unfitted for the armaments and provisions such a vessel must bear when on service. The proportions adopted by different builders vary exceedingly; a vessel of war of 3836 tons is generally about four times its breadth; the proportion ordered for the Ark of Noah was six times its breadth and ten times its height. This form has been found by builders to require but few hands to manage it, but has other inconveniences. The Queen, which, when launched, was spoken of as the perfection of naval architecture, would appear to have every bad fault, being a slow sailer, having a wild steerage, and in unfavourable weather a most uneasy ship. The only respectable vessel constructed within late years would appear to have been the Pique frigate, and though it was spoken highly of by that skilful officer Captain Rous, yet, as he recommended extensive alterations to remedy certain defects, his evidence cannot bear much weight. The Americans had, during the late war, some remarkably fine vessels; one, in particular, the Hornet, was very greatly admired; under every disadvantage, from her superior sailing, she escaped the Caledonia, 74, nor do we believe that our first frigate, the Vindictive, could at all approach her either in speed or in the qualities which should mark a vessel of war; by adopting her form, some improvement might be effected, and though that dependence upon a foreign power may appear humiliating to a naval power, yet it is on all hands admitted that in this department a great change must be effected, or the same losses which occurred during the war with America will again befal us.

BUENOS AYRES—MONTE VIDEO.

The struggle which has been waging for so protracted a period between the neighbouring states of Monte Video and Buenos Ayres is a matter deserving of more impartial attention than it appears yet to have received from our government. Our commercial dealings with the Spanish South American Republics are already far from unimportant, amounting to nearly one million sterling per annum, with every prospect of increase, as the population increases, and the blessings of peace are restored. But in a political point of view, the connexion is of still deeper importance to us. Canning, when he recognised the formation of the new Republics of South America, out of the debris of the ancient rule of the European Peninsula, made use of this remarkable expression, that "he had called a new world into existence, to redress the balance of the old." And now, when the new world of Northern America has been, by the force of circumstances, turned against us in feeling, the value of a substantial connexion with the still newer world of the southern continent becomes of more obvious and vital importance. But, unfortunately, it has been too much the fault of our governors in all times to disregard what they consider little matters and little interests, and to try to recover their position too late, when those influences have become great.

Another evil consequence of our system of management, when we do condescend to interfere in the affairs of weaker states, is, that we are too apt to carry things with a high hand and domineering tone, instead of endeavouring to conciliate the good will, and command the confidence of those whom we assume to serve. This was the case the other day in the affairs of Buenos Ayres and Monte Video, when, by the precipitate notification of the British representative, in concert with the French consul, of a determination of using armed interference to compel the contending parties to an adjustment of their differences, we were well nigh involved in what might have proved a very awkward predicament. From a conversation which occurred in the House of Commons the other day, however, it appears that the government have disavowed this intention, and done all they can to repair the evil consequences of the threat since.

In calling attention to this question now, we have no intention of entering into the merits of the disputes between the contending parties. That is a matter we have very little to do with. But as the public mind has been much prejudiced against the leader of one of those parties, and who, we think, must eventually prove the successful one, we think it but fair to hear what has been said in favour of his personal character, and in exposition of his views and policy, by one who has had an opportunity of judging of them. With this view, we take up an able pamphlet, recently published by Mr. Alfred Mallalieu, being in the form of a letter addressed to the Earl of Aberdeen, and the statements contained in which are well deserving of attention. Mr. Mallalieu sets out with defending the character of Rosas from the wholesale abuse with which it has been assailed.

"I am not constituted either the panegyrist or the advocate of Governor Rosas, neither am I called upon to explain or defend all the acts of his administration. That he is and has been the best and the most abused man of the age there can be no question. It would be strange indeed if the turbid torrent of party calumny and invective rolled against him in continuous current for so many consecutive years, in the press and out of the press, both of the Old World and the New, had not worn at length a passage to the public ear and to the abuse of public faith. And I must say, that hard measure was dealt to him in the last session of Parliament, both by your Lordship and Sir Robert Peel, seeing that no tangible or overt acts of accusation were preferred. The supreme chief of a state in alliance should be entitled to all forbearance, and the most favourable construction of circumstances; nor lightly condemned by those whose judgment, from the authority of high character and station, would pass in public acceptation as without appeal. I cannot but fear lest on those occasions, and in the animadversions to which I refer, there was too much of deference to prejudices out of doors,—too ready acceptance of inculpations from suspicious quarters in the River Plate, which should have been received with the more caution, because *exparte* in the cause or partial of origin."

And again:—

"Whatever the wrongs,—crimes if you will,—justly chargeable against General Rosas and his administration, he is not less a man most foully calumniated to the world. He is unquestionably one of the ablest and most extraordinary men which the hotbed of Spanish-American revolutions has brought forth. If his achievements in arms do not equal in brilliancy those of San Martin and Bolivar,—and they are scarcely second,—he has surpassed both one and the other in the arts of organization and government, in the sagacious estimation of the peculiar genius of his countrymen, and in the politic combinations of forms and institutions best adapted to conciliate ancient habits and associations with the new state of political and social existence to which they have been called, and in which they are destined to abide and advance. He found his country, a new state, grey-headed already with twenty years of anarchy and misrule; a republic, one and indivisible decreed, split into fractions and factions, with far more potentates than provinces; governments which existed only in the Gazette, and succeeded each other with its daily publication; patriots, out of all proportion with the pillage which in all ages has been the perquisite of patriotism; a military more mercenary than the Prætorian bands; an exchequer long empty, though always open to receive; a church without ministers or religion, and a people without morals. Within some half-score years, in the midst of foreign wars, perplexed by federal insurrections, harassed by domestic conspiracies and outbreaks, not unfrequently on the brink apparently of ruin—all that has been miraculously changed. Order has sprung out of chaos; before the one will of a vigorous government, the hordes of petty tyrants have disappeared; revenue enters the treasury, and debtors no longer dun it in vain; religion may be found in the temples, even if waited on by monks for ministers; peace and an immense territory have been reclaimed and secured from the savage Indians, and these sons of the desert have been raised some degrees in the scale of civilization. The people are doubtless somewhat curtailed of liberty, so far as the liberty of licentiousness; the soldiery no longer make chiefs, but obey them; and all this is confessedly the work of Rosas—tyrant Rosas, if you will: but when has the Spanish-American riot of liberal licentiousness produced such fruits?"

His object was that of a great statesman to restore the old federal principle; but the virulent opposition of interested parties for a time thwarted his views; but

"Elected for the second time, (the first in 1829,) and recalled from the private station to which he had retired for some time, to become Governor of Buenos Ayres, General Rosas entered into office in 1835; at the latter end of the same year, Oribe was also constitutionally raised by his fellow citizens to the post of President of the Republic of the Uruguay. In 1836 Rivera, the former President, attempted a revolution, the results of which left him little more than the captain of a band of marauders in the open country, compelled sometimes, on pressure, to take refuge in the contiguous Brazilian province of Rio Grande, until 1838. Then came the famous quarrel betwixt France and Rosas, with the blockade of the River Plate. On the peremptory refusal of Oribe to join in active warfare against Rosas, and his perseverance in preserving a strict and equitable neutrality, the French commanders contracted alliance and made common cause, by sea and land, with Rivera. Against such overpowering odds,—besieged on the land side by Rivera, with semi-barbarous hordes of Indians and outcasts of all the country parts, banded with Rio Grande insurgents; vigorously blockaded seaward by all the naval appliances of a numerous French squadron, with a corps of French marines disembarked and in possession even of the port of Monte Video, under the vague pretext of protecting French citizens in the event of storm and capture of the city,—Oribe, hopeless of succour, and desirous to avert from his country the inevitable misfortunes of a longer resistance, abdicated his post of President, in a note dated October 23, 1838, addressed to the two houses of legislature, remarkable for its dignified tone and the measured reserve of its language. Rivera, of course, took possession of the vacated throne, was duly installed President, and, as such, saluted with salvoes of broadsides from the fleet of France, his patron and protector. He embarked at once in open hostilities against Rosas and Buenos Ayres, who neither had nor could have assisted Oribe, whatever the disposition, seeing the very life-struggle in which he was so desperately embarked with France. Scarcely was Rivera securely seated in his government, when, in 1839—I pray your Lordship's notice of date and circumstance—his *formal manifesto of war was proclaimed* against Rosas, by which he stands convicted of being the first to throw the gauntlet of defiance, or rather say, he was in headlong haste to establish his claim to a large share in the spoils of a Republic about to be dismembered, as he deemed, for apparently *in extremis*, under the colossal pressure of French assaults without, and civil wars—the direst of all calamities—within:

'Omnibus hostes
Reddite nos populis—Civile avertite bellum.'

"Thus was war the seeking of Rivera, not Rosas. In the deplorable state of his fortunes, Rosas—indomitable of resolution though he be, even to an unyielding doggedness scarcely less conspicuous than that of the iron-nerved Charles of

Sweden himself—would have been mad as that heroic madman so to have advisedly diverged from his path to court the chance of more embarrassments and more instant destruction. The memorable events of the war which followed have already passed into the domain of history."

The blockade of Monte Video then took place, followed by the abortive and unjustifiable attempt of Commodore Purvis to interrupt it. This opposition was afterwards withdrawn, but not before it had caused serious mischief, the consequences of which still survive.

"True it is, my Lord, as I have already admitted, that in obedience to precise instructions conveyed through the Admiralty from the Foreign Office, seasoned, as there is cause to believe, with considerate reflections upon his previous erratic deviations from the strict line of neutrality, Commodore Purvis withdrew his opposition to the blockade. But it was a withdrawal, I may say, at the eleventh hour; the wrong was done past recovery, and where was the redress? The siege of Monte Video, but for this ruinous wrong, would not, could not, have been protracted more than one or two months at the utmost, assuming a fixed determination at the time to hold out to the last extremity. The entertainment of such determination may, however, well be doubted at a moment when the city was invested by water as well as by land, with no prospect of relief from without, with, for all defence, a parcel of raw, unorganized rabble of foreign recruits, hastily got together within the place, only too ready to desert their standards on the first pinch of short commons and no pay. It is more than probable, therefore, that the first fruits of blockade would have been a parley; and that negotiations would have bloodlessly concluded a hopeless contest. I need not dilate to your Lordship about the thousand ills, the massacres without and the murders within the devoted city, which might thus have been spared to suffering humanity; not to speak, besides, of the lesser but still inestimable gain of industry and commerce restored, with peace and security to their accustomed channels. What, instead, is the converse of the picture, as resulting from the dashing hand with which the gallant Commodore brushed off the legal blockade? The unfortunate capital of the Republic of the Uruguay has now been subjected to all the miseries of a siege procrastinated for nearly twelve months[a]; the band of foreign vagabondage, by which almost alone garrisoned and domineered, alternately engaged in combating the enemy in the field, or plundering the peacefully inclined citizens at home; martial law in permanence, and military execution the order of the day, as the guillotine in other times of blood and violence;

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[a] Now nearly two years.—Ed. Pol. Rev.

the whole territory of the republic a wild desert of devastation and desolation—one blaze of incendiarism—successively overrun, pursuing or pursued, by the fiercely contending guerillas of one party or the other, so that in this *guerra à cuchillo* the cultivated *estancias* and the guiltless *estanciero* tillers of the soil that escaped the sword, the spoiler, the firebrand on the one side, are proscribed, pillaged and persecuted to the death on the other; but, I am bound to say, most ferociously by the desperate faction of Monte Video. This is no sombre fancy sketch of mine, my Lord; it is now all red, and rife, and reeking with reality on the vast plains enclosed by the Uruguay, from the outskirts of Monte Video to El Cuarey."

Mr. Mallalieu then enters upon the grave question of the policy which this country ought to pursue in this quarter of the globe, and his observations are so well put, and so sensible in themselves, that we quote the passage at some length:—

"It is notorious, my Lord, that an extraordinary disaccordance has existed, would seem to exist still, betwixt the functionaries purely diplomatic and the commander of her Majesty's naval forces in the River Plate, who, with his attributes as such, has exercised the functions of diplomacy. From this disaccord most grave inconveniences and discredit have resulted to British interests. This singular introduction of the military element into the civil or diplomatic service in that quarter of Spanish America, I cannot but consider of very questionable import. I shall content myself with observing, that it has led undoubtedly to great embarrassments and confusion; for betwixt the sayings and doings of Mr. Mandeville, British minister, and Commodore Purvis, British commander, in the River Plate, the differences are irreconcileable. The mission to protect British subjects and property still leaves great latitude to the action of the naval commander, within the circle of his former prejudices. It may, indeed, be feared lest the continuance of his presence in the ports of La Plata should have the effect of confirming his errors, and of embarrassing more and more the political and commercial relations between that country and England, instead of promoting the increase of friendly feelings and relations.

"I cannot think that it should be British policy to raise up, at the extremity of South America, another Texas, like that by which Mexico has been dismembered in the north and weakened, all to the profit of the United States. For the question of Monte Video has in truth all the elements of a new Texas about it. It would be a farce to regard the fraction of a native population in the city of Monte Video as the incarnate embodiment of the Republic of the Uruguay. Out of a population of some 22,000 or 23,000, the number of native residents does not exceed 4,000; they are powerless, whatever their disposition, in the face and amidst the overwhelming numbers of intrusive foreign people. I gather from sources entitled to credit that the population may be thus classed :—

Orientales, or native-born inhabitants	4,000
Argentinos, being Unitarian emigrants and other citizens of the Argentine federation	1,000
Bizcainos, or immigrant settlers from the Bizcaino provinces of Old Spain	1,500
French and Italians	17,000

" In the Chamber of Deputies, the French inhabitants alone are claimed as 17,000. The number of native citizens embodied as troops, and taking part in the defensive operations of the siege, and therefore representing the extent and strength of the national feeling arrayed against Oribe, is less in proportion still in the comparison with foreigners. The component parts of the combined force may be thus resolved :—

French and Italians	8,000
Bizcainos	500
Argentino Unitarians	300
Orientales, or natives of Monte Video	120

" In the petition for aid from the French residents, recently laid before the Chamber of Deputies, embodying also a strong remonstrance against the neutrality observed by the French commanders on the station, it is broadly asserted in substance that Monte Video is, in fact, a French city and colony, and, as such, the protection of France is called for. Your lordship will perceive that, in the numerical sense, the assertion is plausible enough. It cannot certainly be for the interest of this country that a colony of France should be located and in command of the left bank of the River Plate. It will be recollected, that, by a stipulation of the marriage treaty, one portion of the dowry of the Princess de Joinville, Da Francisca of Brazil, consists in a grant of twenty-five leagues square of territory in the Brazilian province of Santa Catharina, to be selected at the option of the French prince, her husband, and stocked with a French colony. Another grant of twenty-five leagues square has been conceded to a Belgian company for colonization purposes in the same province. We all know that, for all intents and purposes, Belgium and Belgian interests are subservient to those of France, and that a Belgian is little else than a convertible term for a French colony. Now the oriental Republic borders upon Santa Catharina, so that Monte Video, a French colony, would have ready communication with the Brazilian province, colonised with French and Belgians. Brazil, Buenos Ayres, and Paraguay, therefore, would be menaced on the River Plate, and on the Parana, in the southern part of South America, whilst, at its northern extremity, the empire of Brazil is threatened, by the pretensions and usurpations of France, to be dismembered of extensive possessions on the left bank of the river Amazons. France assumes to stretch the limits of French Guiana to the mouth of that great ocean river, involving an extent of coast of more than three hundred miles, and, in earnest of resolution, did, some few years since, take military possession of Macapa, a small island in the lake Mapa, immediately contiguous to the mouth of the Amazons. Although the post, after the passage of various remonstrances from Brazil, not unsupported by this country, was at length abandoned, the pretension was not; it is the unsettled subject of negotiation still; one of those, indeed, which remain as a record of Lord Castlereagh's unhappy or blundering oversights of negotiation at the congress of Vienna, where the question should and might have been settled, but was not. The claim of France has no foundation whatever beyond the misnomer of a cape or river, from geographical ignorance in the treaty of Utrecht, corrected or remedied, after all, by the general text and spirit of the treaty. Baron Humboldt, to whom, as the most scientific authority of the age, the disputed question was submitted in Paris, somewhere about the year 1819, decided, after mature examination, and in a scientific and argumentative exposition, that the claims of France were untenable. They are still, however, persevered in. Whilst M. Guizot conducts, or his principles preside over, the foreign policy of France, unjust and ambitious aggression may be forborne, but the war party, *à tout prix*, the uneasy opposition spirits of the chambers, have already seized and are impregnated with the seductive idea, the *grande pensée, à la Napoléon*, of a French Texas in Monte Video, and a large share in the spoils of an unwieldly territorial empire like Brazil."

These matters are well deserving consideration, and ought to be duly weighed by our statesmen. It appears, by correspondence from Buenos Ayres, that the English are getting into strong disfavour, owing to the partiality shown by Commodore Purvis for the Montevideans, and that the French have employed all the plausible and taking manners of their country to secure the ascendancy. Now that the game of war has been played out in Europe, we hope not to be renewed in our time, let us not neglect the no less important states of South America, if we would maintain our high position amongst the nations of the earth.

Let us do justice to the character of the illustrious chief of the state, who has rescued his country from anarchy; who has shewn the greatest respect for Great Britain; but who prefers the happiness of his native land to a popularity which might easily be gained by yielding to the clamour which has been raised against him by foreigners. If we must interfere, let it be to do justice to the great views which animate him to create a power independent of European ascendancy.

CONCUSSION.—PERCUSSION SHELLS.—THE ELECTRIC TELEGRAPH ON THE SOUTH WESTERN LINE.

Captain Warner has again adopted the plan of importuning government by means of his parliamentary friends, but the publication of the official correspondence has entirely destroyed whatever interest the mention of his name formerly created. Even his powerful advocate the "Times" is apparently tired of repeating the wonders of the long range, and the invisible shell: the only feeling now existing is the surprise at the extreme skill with which government contrived, whilst itself upon the strictest guard, to draw Capt. Warner into the most extravagant assertions. Had he consulted any true friend capable of directing him, he would have been advised by all means to avoid any lengthened correspondence, in which, unlettered as he was, he could have had no chance with the skilful agents of government; and now the subject is understood, the repetition of the foolish and expensive experiment at Brighton would but create ridicule. Certainly an exhibition of the long range would powerfully excite public interest, and with his strong interest, he could, doubtless, again obtain the offer he so foolishly rejected of £500, men, and ammunition, and no time could be more favourable than the present. The recent trials at Portsmouth, with the new projectiles, have been most disastrous—concussion and percussion shells have experienced nearly the same fate; still, since in this, as in every other research, a long and laborious investigation can alone lead to success, we trust that the field for these interesting experiments may be even enlarged. To government, provided with guns, range, men and ammunition, the expense is but a few shillings: to inventors, the preparatory expenses would be ruinous, and by placing the trials under the entire charge of an officer, acknowledged by all so skilful and considerate as Sir Thomas Hastings, we should be guarded effectually against any abuse of this liberty. The distrust of this valuable officer was perfectly inexplicable on the part of Capt. Warner, and was clearly the first thing which inspired the doubts of Sir R. Peel. Had, during the days of recent trial, each invention been his own, Sir Thomas Hastings could not have displayed a greater interest, and in giving facilities, he was ably seconded by that rising officer, Commander Lowe. The very last person to whom we should have thought objection would have been made, is Sir Thomas Hastings, an officer honoured, not only by the Admiralty, but by every one with whom his official duties bring him in contact. Capt. Warner will see that, though the inventor of a successful concussion shell would have been well rewarded, that had Capt. Norton, Col. Dansey, and Mr. Marsh insisted, before their trials, on the guarantee of some high reward, and the premier and parliament had agreed to it, that they would now have been placed in an unpleasant light. All have failed. It is true, by bringing prominently forward the successful shells, the failure may be glossed over; but still the truth must appear in the official report, that, in despite of every favourable circumstance—a day without wind—the shells fitted but a few minutes before firing—the result has been what we have always foretold: there is no certainty. Any of the inventors would be puzzled to say what, when fired, the next shell would do—explode near the gun—not at all—or explode as was foretold.

A review of these interesting experiments will shew the truth of the old adage, " There is nothing new under the sun." Many years back, an officer named Wilton proposed a shell, the fuzee of which was to fire the bursting powder at the second blow; in fact, a " concussion" shell. His arrangement depended upon a brass wire running through the composition, the firing of which would, he calculated, have rendered the wire exceedingly brittle, and thus give, at the second blow, or what it received at the target. The objection against this was the action of the saltpetre on the wire, and its great uncertainty when fired. Capt. Norton suggested the certainly very great improvement of making this wire of fusible metal —a compound of bismuth lead and tin, melting at the low temperature of twenty-one degrees Fahrenheit: by this, the explosion of the shell at the second blow was rendered more certain; but we do not clearly see how the defects of Mr. Wilton's shell are otherwise got over: the compound metal must be equally liable with Lieut. Wilton's to injury from corrosion of the potash; at short distance, the fuzee must be equally liable to be extinguished by the blow, and the explosion half-way, which never hardly occurs in Wilton's shell, is possibly caused in Capt. Norton's by the want of some more efficient support than the metal, when liquid from heat, can give. Still, imperfect as the inventor must admit this shell to be; inferior, as undoubtedly it is at present, to the shells of the service, it is decidedly the best constructed of those fired from the Excellent. The percussion shells failed entirely, but still the experiment with them was of peculiar interest; the detonating ingredients out of the four shells fired exploded twice in the passage, and in the other two struck the ship without explosion. The blow within the gun was clearly, therefore, of a more violent nature than that of the hulk; yet we are convinced it will be possible to form a percussion shell, when the investigation shall be commenced by a scientific person, who shall have, like Capt. Norton or Col. Dansey, sufficient authority with the Admiralty or with the Ordnance to obtain those frequent opportunities for practice, without which it will be impossible to succeed. The experiments with the "percussion shells" have satisfactorily demonstrated that in a successful percussion shell, the explosive agent must be formed by the blow from the gun and the flight: this is theoretically practicable; several ingredients could be named, but if the detonator is introduced, ready formed in the shell, it will either explode from the first blow of firing, or not at all. We speak, now, of firing from the service guns, for nothing can be more dissimilar than the firing at Woolwich with smooth or new guns, and the firing from the Excellent with those worn from continual firing. Long and tedious must, however, be the course of experiments to carry out such a plan; failure after failure would, probably, tire even the most zealous officer of the service, and at a time when the experiments promised most favourably, the permission to continue them might be withdrawn.

Some practical idea may be formed of the blow struck by the discharge of eight pounds of powder, by the fact, that a shell, which resisted a fall of four hundred feet, could not, though cased in felt and guarded by wooden guides, lined with felt, resist it for a second. The crush fired it, and the shell had scarcely left the gun ere it broke, a result which rendered it certain that so nearly corresponding are the two blows from the gun, and the resistance of striking the mark at two thousand yards, that no known percussion agent could be available. It is, indeed, probable, that at three thousand yards the blow from the explosion of the powder is actually the greater of the two. These are facts which Capt. Warner should consider: the blow to project his missile nine thousand yards (the long range) would be ten-fold that with which the explosive projectile would strike, and it is a mistake to believe the explosion from powder is merely a pushing force; it is a direct blow: the limbs of those who have, unfortunately, stood before the gun when fired, are not pushed aside; they are struck as if the gun had been loaded—the limbs are shattered and torn away. The other concussion shells were those of Col. Dansey and Mr. Marsh. The fact of Lieut. Wilton having first suggested the plan, and a model having been deposited in the arsenal, had apparently removed all scruple from the committee, in endeavouring, with Capt. Norton, to render perfect this certainly Wilton's system; but the success has been of a most mediocre character: uncertain as are the shells of Capt. Norton, placed in competition with those of Col. Dansey's, they appear to great advantage; they are uncertain, but those of Col. Dansey appear as certain not to succeed: indeed, the shell of Wilton's would appear preferable. One of these shells fired the Swiftsure: the other inventor is Mr. Marsh, a chemist of considerable eminence, whose test for arsenic is now so universally adopted, for its extreme simplicity and delicacy; and it is no slight praise that the first chemists on the continent have been unsuccessful in their attempts to simplify or improve it. Mr. Marsh has made the shells of Wilton theoretically perfect: to avoid the corrosion of the saltpetre, he has made use of the marine glue; there would be still the objection, that on service, the heat of the tropics would soften it, or the cold of the northern regions render it brittle. We do not know how Mr. Marsh proposes to overcome this difficulty, which the ingenious inventor, Mr. Jefferys, could only meet, by having eight different kinds of glue, varying in softness; however perfect the theory appeared, the practice appeared to us fatal to it. The shells, which answered perfectly at Woolwich, failed, in a very great proportion, at Portsmouth, and as the short fusee would, without the invention, fire the shell, it must be difficult to tell in what proportions the shells of either of the inventors answer; even when exploding on board, they are registered by their inventors as successful.

The great naval port is now connected with London not only by that excellent line of railway, the South Western, but by the electric telegraph communicating with London in a few seconds, it is no small national advantage we derive from this railway, that a few seconds would now cause the concentration of our force upon this important point. The electric telegraph of Professor Wheatstone and Mr. Cooke has been the one selected by Government, on the valuable opinion of Mr. Faraday and Colonel Pasley, as the most practicable of any yet submitted to the public. The printing telegraph of Mr. Bain, which registered its signals, was not approved; the Commissioners finding that time was lost in transmitting the signals, and that the apparatus would be likely, from its complicated nature to become deranged, preferred the extremely simple and effectual telegraph now on the line, and nothing can certainly be more simple. The fact of electric currents deflecting magnetised needles has been long known, and on this the telegraph entirely depends. One needle is deflected by the electric current from right to left once, and constitutes A.; deflected twice, constitutes B.; three times, C. By varying its deflection from left to right, three other letters are formed. By the like deflections of a second needle six other letters are formed. By the simple variations of the two moving together, the remainder of the alphabet is easily made up. This is nearly the first telegraph that was suggested in 1760, and from its extreme simplicity has justly retained a preference over the costly and elaborate systems of Professors Morse and Bain; and the only improvement the last half-century has made, would appear to be the fact of the earth being able to conduct the back current, and thus the number of wires is reduced. The electricity is generated by the battery of Mr. Smee's amalgamated zinc and platinized silver, charged with sulphuric acid and diluted with nine parts of water; as it is requisite to move the needles with some degree of energy, care is taken to have an ample power; thirty jars formed the battery at the station, for the electro-magnet was not in use; however beautiful the theory of this apparatus was in practice, we believe that there is not sufficient power to depend upon it: it is still, however, retained to be applied in case, from any accident, the battery should not be available. The trouble of keeping a battery charged has been very much exaggerated; when care is taken to amalgamate the zinc well, one of Smee's batteries will keep charged for six weeks, at an expense not exceeding a few pence. The intensity of the battery used on the South Western line is greater than would be required in theory, but during the damp weather this excess of power must be particularly useful. Signals are transmitted, of course, instantaneously. We witnessed a strong proof of this: a person, while we were watching the telegraph, touched incautiously the handle. The alarm struck, and was answered so immediately from London as to resemble the second beat of a clock. It is possible that the electro-magnetic telegraph of Professor Wheatstone may not receive a fair chance; for being the joint telegraph, Mr. Cooke would naturally select a power which should not be, as the electro-magnet is, the exclusive property of another. But the opinion of the Commissioner was, we believe, against its want of power, and practically speaking, as an intelligent person must be engaged to work it, the necessity of a battery requiring charging only once a month is not worth consideration. The Directors of the South Western Railway have given, in the kindest manner, every facility to view the extremely interesting exhibition this telegraph constitutes; and a resident at London could now without difficulty converse with his friend at Portsmouth. The rapidity of the railway appears lost in the contemplation of this ingenious adaptation of the laws of nature which the formation of this gigantic undertaking, and the liberality of the Directors have given Mr. Cooke the power of using. The wires are coated with zinc by Mr. Patteson's process, which appears to have greatly protected them from oxidization.

We owe a debt of gratitude to the Directors for the facilities they gave us of witnessing the recent trials of the percussion shells at Portsmouth.

ON THE MINERAL WATERS OF THE BAY OF NAPLES.

A LOFTY secondary chain of mountains, sent off from the central ridge of the Appenines, and running in a direction nearly east and west, enters the Mediterranean about sixteen miles south of Naples, and proceeding in a straight line for eighteen or twenty miles, terminates in the bold promontory of Minerva. This mountain ridge constitutes the southern boundary of the Bay of Naples. Its geological formation allies it to the limestone of the Appenines, while it exhibits some striking specimens of volcanic rocks, although it has been generally and erroneously supposed to be entirely destitute of them. The whole Peninsula abounds with the beautiful scenery peculiar to the limestone formation. It is hollowed out into lovely bays, and upland mountain valleys, abounding in the luxuriant vegetation of one of the finest climates in the world. On either side it is covered with picturesque towns and villages, several of which are historically remarkable. But with these we have nothing to do at present, except in so far as they are connected with our immediate subject. Nearly in the centre of the north side of the peninsula there is a very remarkable table land, rising eighty or a hundred feet out of the sea, and of considerable extent. It consists of an upraised bed of lava, of very ancient origin, filling up a natural indentation of the coast, and on it is built the town of Sorrento, the birth-place of Tasso.

A little further west is situated the town of Vico, not far from which the cuttings for the road have exposed some fine sections of tufa rock, lying as it were on the steep mountain-side, and united closely to the limestone. These masses of tufa appear to be of great extent, and have the same general appearance as those in the neighbourhood of Naples.

At the south-eastern angle of the Bay lies Castellamare, directly under the lofty and precipitous side of Mount St. Michele. It nearly covers the site where Stabia once stood, memorable as the spot where the elder Pliny met his death during the great eruption of Vesuvius in the year 79. From this point the coast turns northward, and it is here that the extensive volcanic formation of the campania joins the limestone of the peninsula. The proper boundary of the Bay, in this direction, is the last slope of Vesuvius, whose graceful outline, so characteristic of volcanic mountains, dips on the western side into the waters of the Mediterranean, and on all others into the level of the wide plain which extends to the Appenines. The frequent floods of lava which have flowed from the mountain into the sea have formed a distinct stratification, consisting of alternate layers of hard blue rock, and fawn-coloured tufa, proceeding from the consolidation of clouds of ashes which have accompanied great eruptions. The excavations for a railway pass through these for eight or ten miles, and have disclosed a series of the most interesting sections, in their kind altogether unique. The resemblance of the compact lava to blue limestone, and the tufa to sandstone, would have afforded strong arguments, in the days of Plutonic cosmogony, for the exclusive agency of heat in the arrangement of the crust of the earth. The north side of the Bay consists entirely of hills of tufa, extending from the city of Naples, by Puzzuoli and the seat of ancient Baia, as far as the promontory of Misenum. Through one of these hills is tunnelled the ancient grotto of Pausilippo, a vast excavation, if we consider the early times in which it was executed. The whole district was once the seat of active volcanic force, and even in comparatively modern times violent eruptions have taken place. In the early part of the sixteenth century the Monte Nuovo was thrown up in one night, and the ancient Lucrim Lake nearly swept away. Embosomed among the tufa hills are some fine extinct craters, now occupied by lakes, and wooded down to the water's edge. Lake Avernus is one of these, which received its name from the deadly influence of its exhalations upon the feathered tribes that swept over its surface. The Lago d'Agnano, another crater, presents some beautiful points of scenery; while at no great distance from it, the hardly extinguished Solfaterra taints the air with its poisonous fumes. Of the magnificence of the Baia no vestige remains. Time and external violence, but above all the ravages of earthquakes, have swept it from the face of the earth.

Crossing the sea, we find the Islands of Ischia and Procida, bounding the Bay to the west; the former of which consists entirely of volcanic rocks. The whole circuit may thus be said to belong to the modern igneous formations, and the circumstance is doubtless the reason why a greater number of mineral springs exist around the Bay of Naples than can be found in any other district of country in the world. Some of these are unique in character, for not only are these sources of water, but also of vapours and gases, and they are nearly all used in the treatment of disease. The springs are by no means equally distributed over the region we have described, but are much more numerous in some localities than in others. By far the greater part of them have undergone no chemical analysis, or at best only an imperfect one, so that our knowledge of them is confined chiefly to their physical and medicinal qualities. The watering-place of Castellamare, with which we shall begin our sketch, is a very agreeable summer residence. The ridge of Mount St. Michele rises like a green wall behind it, to the height of several thousand feet, so as to protect the whole angle of the Bay, for several hours daily, from the fierce sunshine of the summer months; while its northern aspect throws it open to the cooling breezes from the Appenines and from the sea. In the immediate neighbourhood there are no fewer than twelve mineral springs, which are chiefly saline, acidulous, and chalybeate. They are as follows:—

Acqua Ferrata, temp. 64 deg. F.; chalybeate.
Acqua Rossa, temp. 64 deg. F.; chalybeate.
Acqua Speccata, temp. 64 deg. F.
Acqua Rogna, temp. 64 deg. F.
Acqua Contra la Tinea.
Acqua Ferrata de Pazillo, saline ingredients in a pint, 40.579 grains, temp. 65 deg. F.; chalybeate.
Acqua Ferrata Nova, saline ingredients in a pint, 40.246 grains; temp. 65 deg. F.; chalybeate.
Acqua Salfuera Ferrata, salts in a pint, 58.643 grains; temp. 65 deg. F.; sulphureous and chalybeate.
Acqua Acidolo, salts in a pint, 16.821 grains; temp. 64 deg. F.; acidulous.
Acqua Media, (two springs,) salts in a pint, 41.493; temp. 64 deg. F.; acidulous.
Acqua Sol del Muraglione, salts in a pint, 70.55; temp. 67 deg. F.; acidulous.
Acqua Nova del Muraglione, salts in a pint, 73.658; temp. 67 deg. F.; acidulous.

All these waters flow from the secondary limestone near its contact with the volcanic formation, but their temperature does not appear to be influenced by the proximity. It is deeply to be regretted that their chemical analysis has not been made with sufficient accuracy to permit of a comparison being drawn between them and others in the same district of country.

Proceeding northward, the only mineral spring we meet with, flowing from Vesuvius, is at Torre del Annunziata. It is the Acqua Vesuviana, which escapes from a tufa rock, with a temperature of 90 deg. Fah., and it contains grains 39.431 of saline ingredients in the pint. The volcanic formations are all recent, and this solitary spring contrasts in a striking manner with the great number which flow from similar rocks in the opposite volcanic Island of Ischia. An interval of several miles in extent occurs before we again meet with mineral springs. There is not one along the whole western side of Vesuvius, nor in the eastern half of Naples. The city is built upon the older tufa formation, of which a section has recently been afforded by an artesian well. The boring traversed sixty yards of yellow tufa, it then pierced a grey tufa of a much older date, and at the depth of 108 yards it reached the marine formations and sands interspersed with small fragments of pumice. The temperature increased very slowly in the descent, which marks the absence of active volcanic agency under that part of the Bay. The water obtained from the wells in this rock is in general not very good.

The sea line of Naples is divided into two parts by a tufa hill about 100 feet high, which comes close down to the water's edge, and a detached fragment of it extends into the Bay, and sustains the ancient Castel d'Uovo. This district is called St. Lucia, and contains two mineral springs; they are close to the sea, and escape at or near its level, and are resorted to by numbers of invalids during the summer months. The following is their analysis:—

Acqua Solfuera, temp. 64.4 deg. F.; specific gravity less than distilled water.

Gaseous Contents.	Cubic Inches in a Pint.
Carbonic acid	5.47
Sulphuretted hydrogen	.99
	6.46

Saline Contents.	Grains in a Pint
Sulphate of soda	0.013
Muriate of soda	0.050
Carbonate of soda	0.050
Carbonate of lime	0.063
Silica	trace
Oxyde of iron	trace
Oxyde of manganese	trace
	0.171

Acqua Ferrata, temp. 68 deg. F.; specific gravity, 1002; gaseous contents, carbonic acid, 6.956 cubic inches in a pint.

Saline Contents.	Grains in a Pint.
Muriate of soda	0.930
Carbonate of soda	0.075
Carbonate of lime	0.055
Silica	trace
Carbonate of iron	0.045
Carbonate of magnesia	0.001
Iodine	trace
	1.106

Westward of Naples is Puzzuoli, in the neighbourhood of which are several remarkable springs. The first of these we shall mention is the Bagnuoli, which contains an extraordinary number of ingredients, not the least singular of which is alumina. It is found only in one other locality, at Toplitz, but in much smaller quantity.

Acqua Bagnuoli, temp. 107 deg. F.; specific gravity, 1004.6.

Gaseous Contents.	Cubic Inches in a Pint.
Carbonic acid	2.902
Azote	0.378
Oxygen	0.002
	3.282

Saline Contents.	Grains in a Pint.
Sulphate of soda	5.1742
Muriate of soda	10.7640
Bicarbonate of soda	3.3400
Bicarbonate of potass	0.8125
Silicate of potass	1.1250
Bicarbonate of lime	1.2487
Muriate of lime	0.8750
Bicarbonate of magnesia	0.2619
Sulphate of magnesia	0.5486
Alumina	3.6000
Bicarbonate of alumina	0.5625
Sulphate of alumina	21.9600
Bicarbonate of iron	0.0044
Bicarbonate of manganese	a trace
	56.2768

On the hill above Puzzuoli is the Solfaterra, a volcanic crater which has been only once in a state of activity within the historic period, although it has frequently evinced signs of disquietude, and does so at the present time. Its floor is horizontal, and consists of a bed of sulphur, which is dug up and purified on the spot. There are vents through the crust by which there is a constant escape of steam, used to supply heat in certain rude chemical manufactures carried on close to them. The neighbourhood of this crater has a powerful influence on the mineral waters which escape from the hill. The most characteristic of these is the Acqua Pisciarelli, whose chemical constitution connects it closely with the volcanic products of the crater itself, as the following analysis will be sufficient to prove:—

Acqua Pisciarelli, temp. 156 deg. F.; gaseous contents, sulphuretted hydrogen, 4.01 cubic inches in a pint.

Saline Contents.	Grains in a Pint.
Sulphurous and sulphuric acid	7.323
Sulphate of lime	12.440
Sulphate of iron	5.126
	26.889

At Puzzuoli are situated the well-known remains of the Temple of Jupiter Serapis, a remarkable monument in a geological point of view, from the indubitable evidence it affords of the fact that the whole of the adjacent sea-shore has been submerged for ages beneath the waves, and then raised to its present position. This temple appears to have been famous at the time of its early history for the mineral waters which still flow from the rock immediately behind it. There is, indeed, no distinct mention made of any of them by name, but from a passage in the thirty-first book of Pliny they appear to be identical with the springs which were discovered near Cicero's villa, which stood behind the temple. Should such be the case, we should have a singular instance of mineral waters still retaining their locality, as well as their properties, after a great geological catastrophe which buried their points of exit below the level of the sea. At the present day these springs are resorted to for the cure of a variety of diseases, and in some they are said to be highly useful. The waters flow slowly from the tufa rock, and are received into cavities underneath arches of ancient masonry. They are four in number, although two of them evidently proceed from the same source, but having different exits.

1. & 2. Acqua Antro, and Acqua del Machino; temp. 106 deg. F.; specific gravity, 1004.6.

Saline Contents.	Grains in a Pint.
Sulphate of soda	4.516
Sulphate of lime	0.250
Muriate of soda	9.567
Carbonate of soda	11.225
Carrbonate of magnesia	2.990
Carbonate of iron	0.530
Silica	0.060
	29.138

3. Acqua Dei Lipposi; temp. 90 deg. F.; specific gravity, 1004.6; gaseous contents, 9.14 cubic inches in a pint.

Saline Contents.	Grains in a Pint.
Muriate of soda	24.716
Carbonate of soda	10.690
Carbonate of lime	1.115
Carbonate of magnesia	1.860
Silica	2.125
	40.506

4. Acqua Media, temp. 90 deg. F.; specific gravity, 1004.6; gaseous contents, carbonic acid, 5.20 cubic inches in a pint.

Saline Contents.	Grains in a Pint.
Muriate of soda	18.149
Carbonate of soda	2.495
Carbonate of lime	1.125
Carbonate of magnesia	1.960
Silica	1.167
	24.896

The Acqua Dei Lipposi, as its name implies, is employed in diseases of the eye, and with good effect in certain cases; and the account of Pliny to which we have referred describes the mineral waters near Cicero's villa as "fontes calidi perquàm salubres oculis, celebrati carmine Laureæ Tullii;" in whose verse there occur the following lines:—

> Hic etiam apparent lymphæ non ante repertæ,
> Languida quæ infuso lumina rore levant:
> Nimirum locus ipse sui Ciceronis honori
> Hoc dedit, hac fontes cum patefecit ope.
> Ut, quoniam totum legitur sine fine per orbem,
> Sint plures oculis quæ medeantur aquæ.

This description, in conjunction with the fact that the ruins of Cicero's villa are not far from the present sources, appear to prove their identity.

At a short distance from the waters of the temple, there is another spring a good deal resorted to, the

Acqua Sabveni Homini; temp. 103 deg. F.; specific gravity, 10.10; gaseous contents, carbonic acid gas, 914 cubic inches in a pint.

Saline Contents.	Grains in a Pint.
Muriate of soda	44.566
Muriate of lime	5.263
Muriate of magnesia	5.149
Carbonate of magnesia	0.600
Carbonate of lime	0.700
Carbonate of iron	0.700
	56.978

Not far from Puzzuoli is the Lago d'Agneno already alluded to. It is an extinct crater, with a lake in the bottom of it, and has given no signs of eruption within the historic period. It was once the property of Lucullus, who built a magnificent villa on its banks, and it is now a royal park and chace. On its banks, close to the water's edge, are situated three remarkable sources, two of gas and one of vapour. The Grotto del Cane has been long known as an interesting natural phenomenon. It is an excavation like a small cellar cut out of the tufa rock which forms the wall of the crater, and the floor is sunk about a foot below the level of the doorway. This depression of the floor is constantly filled with carbonic acid gas, which flows into it in great quantity from the rock. A lighted torch burns freely in any part of the excavation except close to the floor where it is instantly extinguished; and its smoke floats on the surface so as to show the height of the gas, and flows with the current out at the door step and down the declivity. Of the cruel experiments on dogs, from which the grotto takes its name, we shall say nothing, except to deprecate the idle and senseless curiosity of travellers which can find any gratification in the sufferings of dumb animals.

A little further up the hill there is another grotto, which was erected about a dozen years ago over a spring, if we may use the term, of ammoniacal gas, discovered accidentally in digging the foundations of a hunting lodge. The gas flows into a trench, about a yard deep, which has been arched over to prevent escape, and it is not a little singular that it occupies the trench and never rises to the upper part of the building, contrary to what its specific gravity would lead us to expect. The gas is not, of course, pure ammonia, but is in all probability in combination with carbonic acid, although the point has not yet been determined.

The experiment with the lighted torch gives the same result as in the Grotto del Cane, and animals plunged into the gas are almost immediately suffocated with evidences of great pain. The ammoniacal grotto is a favourite resort of persons labouring under diseases of the eye; and numerous cases are related of its efficacy in chronic, inflammatory, and amaurotic affections. The patient immerses his face in the vapour, or laves it over his eyes with the hands. The gas, no doubt, proceeds from volcanic action deep in the bowels of the earth. Ammonia is almost continually evolved from Vesuvius, and combining with muriatic acid, which is also a constant product, it is deposited in crevices of the lava, in white chrystalline masses, which are gathered and sold by the peasantry of the mountain.

The Stufa di San Germano is a natural vapour bath in the immediate vicinity of the gaseous springs, and close to the ruins of the villa of Lucullus. The steam flows from the tufa rock in considerable quantity, and the temperature of the bath is 160 deg. Fah. It is protected by proper buildings, and is employed in gouty and rheumatic cases.

Leaving the beautiful little lake and proceeding further westward, we find no mineral springs of any consequence. Before the earth opened and threw up the Monte Nova, there were several which were much resorted to; but the town where they existed was totally destroyed, and they too have disappeared. On the banks of the lake Avernus there is a tunnel called the Grotto of the Sybil, which contains apartments that appear to have been formerly used as baths; but they have long ceased to attract attention.

Arriving at the once beautiful shores of Baia, we find a curious vapour-bath, directly under the site of the Palace of Nero, to which in all probability it belonged. Close to the sea-shore there is a section of tufa, and a few feet above the road there is a door cut that leads to a little chamber, from which there is a long passage in the rock, directly away from the sea, at first horizontal, and then descending to the sea level, where it ends abruptly, and the floor is covered to some depth with salt water. The temperature of the excavation is 180 deg. Fah. There is not much escape of vapour, but the heat is overpowering. The bath is not now used except as a matter of curiosity. The guide who accompanies the visitor takes a small bucket containing an egg or two in his hand: he descends as quickly as possible by the light of a torch, plunges the bucket into the water, and makes his escape with all speed. The eggs are found fully cooked on arriving in the open air.

It is singular how little the phenomena of nature vary from age to age. For even along this line of coast, which is remarkable above all others for the geological revolutions it has undergone, we find its water springs bearing the same characters which they did eighteen hundred years ago. Perhaps no general description would be more applicable to their present state than that of Pliny. Of mineral waters he writes:—"Nusquam tamen largiùs quàm in Baiano Sinu, nec pluribus Auxiliandi generibus, aliæ sulphuris, aliæ aluminis, aliæ salis, aliæ nitri, aliæ bituminis, nonnullæ etiam acida, salsave mistura. Vapore quoque ipso aliquæ prosunt. Tantaque ei est vis: ut balineas calefacient, ac frigidam etiam in soliis fervere cogant, quæ in Baiano Possidoniæ vocantur, nomine accepto à Claudii Cæsaris liberto. Obsonia quoque percoquunt. Vaporant et in mari ipso, quæ Licinii Crassi fuere: mediosque inter fluctus existit aliquid valetudini salutare. Jam generatim nervis prosunt, pedibusve, aut coxendicibus, aliæ laxatis fractisve. Inaniunt alios. Sanant ulcera. Capiti auribusque privatim medentur: oculis vero Ciceronianæ."[a]

The preceding analyses show that almost every variety mentioned by Pliny is still to be recognized; and they are all even now resorted to for the cure of the same kind of diseases.

MINERAL WATERS OF ISCHIA.

The island of Ischia is about eighteen miles in circumference, and consists entirely of lavas and tufas. It is a slumbering volcano, which may at any time break out into eruption, and this circumstance impresses a peculiar character on its mineral waters. They are all saline or alcaline, and have a remarkably high temperature, while they are in greater number than any where else. The island is much resorted to on account of its warm and vapour baths, and has an hospital for invalids sent from Naples.

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[a] Pliny Hist. Nat. lib. xxxi.

The following table will give a general idea of their nature:

Name.	Saline Contents in a Pint.	Temperature.
Acqua Pontana	——	94 deg. F.
,, Fornello	——	138 ,,
,, Castiglione..	69.187 grains	167 ,,
,, Gurgitello ..	40.609 ,,	158 ,,
,, Cappone ..	39.322 ,,	98 ,,
,, del' Occhio	23.791 ,,	100 ,,
,, Sperma Polastra	——	180 ,,
,, Della Collata	——	179 ,,
,, Cociva	——	190 ,,
,, Sinigalla ..	——	145 ,,
,, Ferrata	——	——
,, Bagni d'Oro	——	150 ,,
,, Di Rivaz ..	——	178 ,,
,, Di Tamboro	——	210 ,,
,, Della Rita	24.215 ,,	158 ,,
,, De Verde..	——	178 ,,
,, Santa Restituta	126.525 ,,	122 ,,
,, San Montana	——	131 ,,
,, Francesco Imo	36.592 ,,	113 ,,
,, Citara	32.269 ,,	125 ,,
,, Olmitello	94.000 ,,	112 ,,
,, Petrelli	——	205 ,,
,, Nitrioli	4.105 ,,	86 ,,
,, Isabella de Bourbone	31.770 ,,	107 ,,
,, Capitello	48.469 ,,	152 ,,
STUFE OR VAPOUR BATHS.		
Acqua San Lorenzo ..	——	136 ,,
,, Caccinto	——	160 ,,
,, Testaccio	——	120 ,,
,, Castiglione	——	120 ,,

So large a number of hot springs bespeaks the presence of an extensive heating cause not far from the surface, and there are some curious facts, which prove that it stretches even under the waters of the ocean. It is not an unusual way of surprising visitors for a fisherman to take a hot stone from beneath the water. He scrapes up the sand for a few inches in depth, and lifts the stone from amongst it. The catching and cooking fish is also practised nearly on the same spot. A trough is hollowed in the sand close to the edge of the sea: the bottom of it is sufficiently hot to raise the temperature of the infiltrated water nearly to the boiling point, and the fish is then put into it. At the particular part of the coast where this can be done, there is, no doubt, a great mass of hot lava below the bed of the sea. It is not uncommon for such masses to retain a red heat in the open air for many years. One of those in Ischia is said, by M. Dolomieu, to have emitted fumes above 450 years after it flowed from the mountain.

The whole subject of the mineral springs of the Bay of Naples is replete with interest. We have seen that they exist in volcanic formations of every age, as well as in the secondary limestone. A thorough investigation of them would have an important bearing on many points of geology and natural chemistry; but unfortunately Naples is not the place where such inquiries are likely to be undertaken.

DWELLINGS OF THE POOR.

We have in this number, the satisfaction of calling public attention to a short prospectus, and the plans of the "Metropolitan Association for improving the Dwellings of the Industrious Classes," with a capital of 100,000*l.*, in 4000 shares at 25*l.* each, the interest on which is very properly limited by Royal Charter. The benevolent intention of this association, though different in the mode of its operation, is identical with that of the various societies for affording shelter and relief to the houseless and destitute poor; the object of the latter being to relieve existing suffering, that of the association being to place a check upon its *recurrence.* The efforts of charity may relieve the suffering of those who have no other trust, who know not of a parent and a friend that watches over all, who have no means, who have no power bodily or mental to help themselves; and who can say that such efforts do not reflect the highest honour upon those who make them, yet experience unhappily proves that, the more extensive the supply of purely gratuitous relief, the more craving become the claims upon its funds; it may relieve the destitution, but it does not tend to check improvidence or even the less culpable sources of evil.

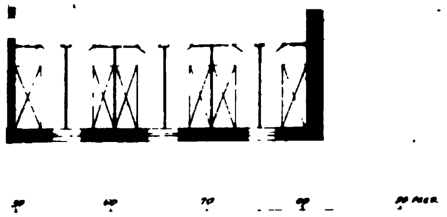
Surround a man with misery, filth, and discomfort of every kind, and who can wonder that he flies to the beer shop or the gin palace, to obtain a temporary forgetfulness of his wretchedness. Place him in the midst of a pestilential atmosphere, and you make him the victim of disease; here then, are two fruitful sources of his gradual degradation and ultimate destitution. Will the benevolent rest contented with alleviating the suffering caused by these poisonous influences, and neglect to apply the *antidote* which may in the course of time eradicate the poison itself.

We are glad, therefore, to call the attention of our readers to the plan proposed as a remedy, and request them to bear in mind, that the main object of the association is to give the working man that amount of comfort and cleanliness in his habitation to which the rent he pays entitles him, *no gift is intended*, whatever he enjoys he is to pay the full value for, but no more; he is to feel the comfort and the worth of his own independence, he is not to be placed in a position equally destructive to his moral and physical powers, in order that his fellow man may roll in wealth through the medium of his degradation. It is notorious that enormous profits are obtained from the occupation of the most wretched dwellings; who then can doubt, that by judicious management a moderate return may be secured from the occupancy of much superior accommodations, and this return will be limited by Royal Charter.

The plan is simple, and likely to be productive of the most beneficial consequences; whether it be considered a preparation for, or an auxiliary to, sanatory legislation, it is equally valuable. It is, in fact, calculated to work, by the most gradual means, a revolution in the physical condition of the working classes. When once its practicability has been shewn by experiment, and its advantages felt, the example set in the metropolis will be copied in every large town in the kingdom. There is a peculiar reason, at the present time, why some such plan should, with all convenient speed, be put in operation in London. We are every day opening new streets, through districts inhabited by the poorer classes; we are knocking down by scores the tenements in which they have hitherto found shelter, in order to build houses for those who have wealth. What becomes of the population thus dislodged? They are driven into other unhealthy localities, where they compete for the miserable abodes still accessible, and aggravate all the evils previously existing. Our metropolitan improvements are, therefore, no improvements, so far as the poorer population is concerned; St. Giles's is at this moment in process of being opened by new streets, and the wholesomeness of the region will, no doubt, be improved; but the improvement will be effected by driving many hundreds away, to abodes as close, filthy, and infectious as those which have just been pulled down.

A metropolitan society for improved dwellings for the industrious classes has not, therefore, appeared until it was much needed, and its importance at the present time will be felt by all who take the least interest in the welfare of the working classes.

We have never seen any scheme of a benevolent nature more



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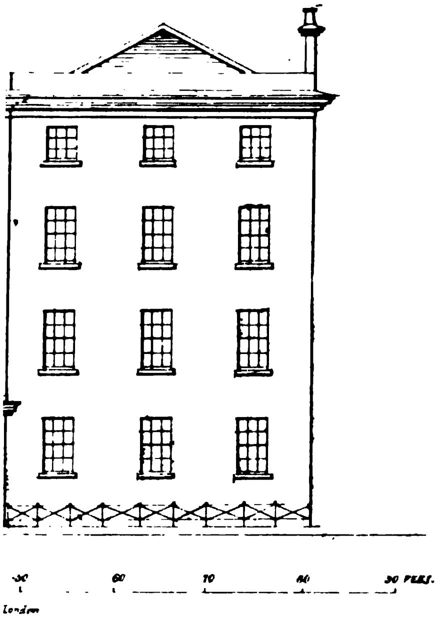

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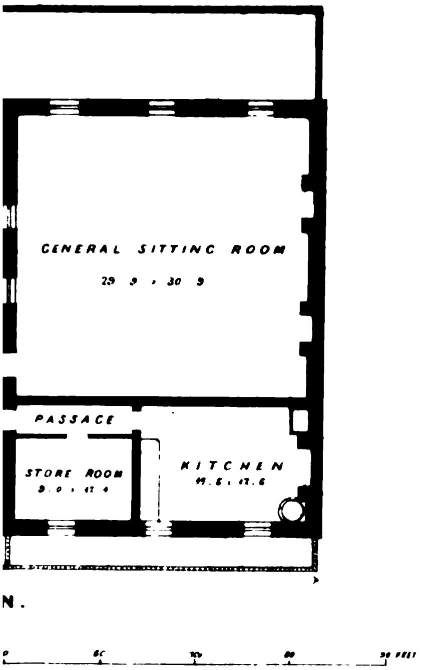

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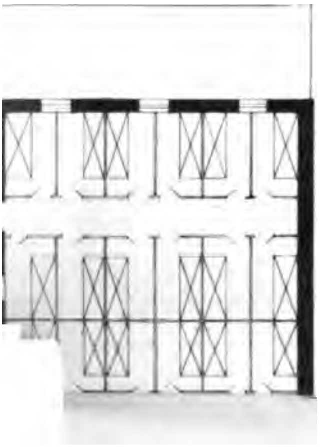
PLAN OF DORMITORY.



likely to attain extensive good, and the excellent and distinguished persons under whose sanction it comes before the public, will, we have no doubt, before long, enjoy the satisfaction of seeing it completely successful.

EARTHQUAKES.

TO THE EDITOR OF THE POLYTECHNIC REVIEW.

Sir,—Having published at different periods, views on the origin and causes of the Comrie earthquakes, I trust you will be so kind as to give the following brief narrative of the results of my investigations into the phenomena of earthquakes a place in your valuable Journal:—

Having, in 1839, undertaken the investigation of the phenomena of the Comrie earthquakes, under the great advantage of residing at Comrie,—I may here observe, but under every disadvantage inseparable from humble life—but my two greatest difficulties arise from the fact that I have no practical knowledge of electricity, consequently I may have misunderstood Sir H. Davy and Mr. Crosse, from whose labours I have principally drawn the electrical inferences attendant upon the phenomena of earthquakes; and secondly, from the fact that the views I have propounded are totally at variance with the prevailing and popular system of geology. Consequently, the powerful advocates of this system contend, that the facts from which my inferences are deduced, are not the causes of the earthquakes but only coincidents; therefore, they will not employ a thoroughly experienced meteorologist to investigate the phenomena upon the spot, who alone can satisfactory set the question at rest. Should any scientific association think the subject of such practical importance as to induce them to investigate the subject more fully, I will be most happy to give them every information in my power. In submitting the following brief summary on earthquakes to the scientific world in general, and to electricians in particular, I trust they will support and extend what they see right, and correct and suppress what they see wrong; all I ask is, that they will not be guided by any system of geology but by facts alone, consistent with the phenomena observed and eliminated, or viewed as a purely organic formula, agreeable to electrical conditions.

1st. The earthquakes are the effects of an electric discharge principle, confined to the surface stratum of the earth.

2nd. The electric discharge which produces the Comrie earthquakes originates in the gorge of the Lednoch, about half a mile north from the centre of the village of Comrie.

3rd. The Comrie earthquakes owe their origin to the excavation of the Basalt dike, upon the edge of the river Lednoch, in 1787, whereby the dike is charged by highly frictionized water, so as to evolve galvanism, by which the subjacent ground is charged by an excess of electricity. There are other dykes in the gorge that the water also penetrates, so that with the enormous friction of water it may be said that there is a compound electrical operation going on in the gorge, viz. by the hydra principle of the friction of water, and the galvanic principle by the water penetrating the Basalt dikes.

4th. Most probably in some instances the shock may be produced by the change of temperature which so frequently occurs at the time of earthquakes, in other instances (perhaps in all) it is the effects of the atmospheric electricity, being in the negative state, the influence causing the discharge being attraction; if not, it must be by some unknown elemental discharge.

5th. All the dangerous and alarming earthquakes are preceded by much wind or rain, or both. I need not inform the learned that storms of wind and rain occur without being followed by earthquakes, they are rather the exception than the rule.

6th. All the dangerous earthquakes extend farthest and severest in the direction of the storms that precede them, the quantity of the electricity in the earth being increased by the storms communicating atmospheric electricity to the earth; for example, all the dangerous earthquakes in October, 1839, were preceded by much rain from the north-east, those shocks were transmitted much farther and severer in north-east directions than in any other direction; the great shock of 23rd October, 1839, was more sensibly felt at Aberdeen than it was in the south, in places only one half the distance from Comrie. Again, the great shock of the 30th of July, 1841, was preceded by a storm of wind from the north-west; the shock was transmitted to Helensburgh and Dunoon on the south-west, and to Fort William on the north-west, which is double the distance that the shock was observed in other directions. At Dunblane, which is only seventeen miles south from Comrie, taking the roundabout road, they did not observe the shock that preceded it.

7th. Earthquakes are modified by the quantity and altitude of the clouds, and by the quantity of vapour; likewise by the degrees of atmospheric pressure: for example, upon the 12th of October, 1839, there were five earthquakes, differing in size; but when the terrible shock occurred, at 3 p.m., the quantity of clouds was much greater, and their altitude lower, than at the time of the other shock. Again: upon the 30th of July, 1841, there were six shocks, differing in size; at the time of the dangerous shock, at 2 p.m., the clouds were far greater in quantity, and lower in altitude, than at the time of the other shock. As for the awful shock of the 23rd of October, 1839, the air was so thick and dark, that it may be said that the earth was enveloped in clouds at the time of the shock. Again: upon the 23rd of August, 1843, we had a considerable shock, preceded by variable weather; at the time of the shock the clouds were large and low. Again: upon the 14th of January last, we had two of the most considerable shocks that have occurred since the 10th September, 1841; there were no clouds at the time of the shocks, but the quantity of vapour in the air was great; it was a day that was ill adapted for distant views —the atmospheric pressure was remarkably light. I should mention that the ground was covered with snow, much of it having melted on the preceding day. The above is a fair specimen of the earthquakes of Comrie.

8th. Earthquakes, that are preceded by wind, are more sensibly felt upon high ground than those that are preceded by rain.

9th. The intensities of the earthquakes have no reference whatever to the quantity or extent of the shocks, but is wholly regulated by the dryness of the atmosphere: for example, the shock of the 23rd of October, 1839, was greatest, both as to quantity and extent; but the shock of the 30th of July, 1841, was the most intense: in the former, the weather was wet—in the latter it was dry. Had the former shock equalled the latter in intensity, or the latter the former in quantity, in either case, the damage done to buildings in this district would have been immense. To the unlearned I would say, were two shocks occurring equal in quantity—the one occurring upon a wet day, the other upon a dry day—the one occurring upon the wet day would be slower in motion; consequently, it would last longer than the one upon the dry day. Common sense may tell any man that a quick jerk would damage a house more than a slow jerk.

10th. The sound of the earthquake is the effects of the reverberation of the ground; consequently, the loudness depends more upon the intensity of the shock than upon the quantity. Hence, the shock of the 30th July, 1841, was the loudest, although less in quantity, than the shock of the 23rd of October, 1839.

11th. Those slight explosive sounds that are so frequently heard in the neighbourhood of Comrie, especially after the large shocks, are the explosion of hydrogen and oxygen gas consequent upon the decomposition of water by galvanic action. In the bassalt dikes in the gorge of the Lednoch, there were five of them heard after the great shock of the 12th of October, 1839; from twenty to thirty after that on the 23d; and eight after the great shock of the 30th of July, 1841. It is certainly imposing upon the public to publish them as earthquakes.

12th. Contemporaneous with the change of climate by the superior cultivation of the soil, the earthquakes have been modified into a milder form. During the first twenty years of the earthquakes of Comrie dangerous and alarming shocks were frequent; subsequently, dangerous earthquakes were unknown here until 1839. At the commencement of the earthquakes, much of what are now the fertile fields of Strathearn were only marshy bogs and stagnant water, the drainage of which has brought our climate to a more temperate state. Unquestionably, the vapoury state of the atmosphere is a most important item in the phenomena of earthquakes; the drainage of stagnant water and marshy soils modifies the vapoury condition of the atmosphere.

13th. If the many and dangerous earthquakes of October, 1839, and subsequent years, were the result of peculiar effects upon our atmosphere by the appearing or rather receding of Halley's comet, a repetition of such alarming earthquakes cannot occur until astronomical causes produce similar effects upon our atmosphere.

JAMES DRUMMOND.

Comrie, Dec. 14, 1844.

P. S. The Lednoch is fed by mountain rills descending upwards of 1,500 feet in the course of five miles, when these united waters are concentrated in Glen Lednoch, and precipitated through the chasms and waterfalls of the Muckle and the Little Diel, at a short distance ere they reach the bassaltic dyke at Comrie House. Hence the waters of the Lednoch at Comrie House have undergone intense friction, and in such a state enter the cavities of the dyke, by means of a quarry opened in the year 1787, whenever considerable land floods occur. Immediately subsequent to that date, the Comrie earthquakes commenced, and have continued at intervals ever since.

SIR WILLIAM BURNETT'S PATENT.

When Chemistry was making those rapid strides which astonished the world, it was looked upon as an abstract science little likely to prove of essential service for the ordinary purposes of life; what a rapid change has a few years produced, it now is the general source to which we look for the improvement of every article necessary in the various branches of art. Scientific men employ the observations which they make in the laboratory, and render them subservient to our wants and wishes. Sir William Burnett having noticed the peculiar power of chloride of zinc in rendering vegetable fibre indestructible and incorrodible, quickly invented a process by which he is enabled to preserve some of the most important materials from the ravages of the dry rot, from mildew, from the effects of the insects; and even from fire. He has given us means, whose efficacy daily experience approves, of preserving ships, sails, cordage from the destruction to which the were liable. His patent has been now some time in the hands of an association; and it has been found to surpass the sanguine expectation which had been formed. The process which is now at work on a large scale, both in her Majesty's dock-yard at Portsmouth and at Poplar, is most ingenious. The hydraulic apparatus is in both places well worthy the attention of those who are interested in the public advancement, as well as those whose interests are more immediately affected by the advantages which are to be derived from the ingenuity of the discovery. The vast mass of testimony of those, who under different circumstances have tried the process, is so directly in favour of it, that no one could hesitate in giving it a fair trial. The severest tests in our naval stations have shewn that timber, canvass, cordage, and woollen cloth impregnated with the neutral salt, the basis of Sir William Burnett's invention, become so permanently changed, that they resist the ordinary causes of decay. The preservative power diffuses itself throughout the organic structure, in consequence of mechanical means, and articles properly prepared by it cannot be eroded by fungi, or acted upon by moisture. Some of the chemists who have examined materials submitted to its action, are of opinion that a permanent chemical union takes place between the organic fibre and the metallic base of the salt; fungous vegetation, so generally destructive, seems to be completely prevented by it; exposure to the action of the atmosphere does not in any way act upon substances which have been impregnated. In the trials made in the ships in the Pacific Ocean, the result has been most satisfactory; we learn from the proper authorities, that that the sails of steam vessels, although exposed to the vicissitudes of alternate wet and solar heat, have required no repairs, and that even steam and smoke have had no influence upon sail covers. Vessels employed in trade, where heat and cold alternate, ought to adopt the invention which, in China and in Africa, has proved so serviceable. It appears that salt-water increases the efficacy of the solution. One most important fact is, that unlike some of the means which have been recommended for adoption it is perfectly innoxious, that the most delicate are not likely to have their health at all affected by it, so that it may be safely used in all steam-vessels, even where there may be collected together a large number of persons. The oxidation of metals is retarded by it, and some satisfactory experiments have shown that both copper and iron are less susceptible of rust. One of the advantages it possesses is that of rendering bilge-water less offensive. From all that we have learnt we have little doubt that it will be most extensively employed, and that the Directors of railroads will be induced, from the high character it has deservedly gained, to use on railways a process with which they cannot fail to be satisfied.

REVIEWS.

United States Exploring Expedition.

Messrs. Wiley and Putnam are importing all the valuable works which issue from the prolific pen of our American brethren; but for none will the scientific world be more grateful than for the five volumes lately published, containing the narrative of the expedition under the command of Capt. Wilkes, during five years, commencing in 1838. These, however, it is understood, will not embrace the monographs of the different naturalists and men of science attached to the expedition.

Christ Our All in All. By the Rev. Robert Montgomery. Baisler.

This volume consists of five sermons, the substance of which was preached by the author at the chapel in Percy Street, where a large and highly intellectual congregation has been collected together during the short period of Mr. Montgomery's ministry there. These discourses are characterized by the same beauties and the same defects which we have pointed out as inherent in all that issues from that distinguished man. There is the same high poetic feeling, the same fervid eloquence, that breathes in all his religious works. We cannot but acknowledge the impassioned tone in which he speaks, and the striking imagery of his language; but we always dread his approach to that style of expression which would make religion a mere rhapsody of words. He is the first of a school which, however captivating and popular it may be, is not at this moment so highly appreciated, for we look for deep reflection, for quiet contemplation, and a rigid scrutiny of the writings of the fathers of the church. Matters of faith now so completely absorb the Christian mind, that the eloquent appeals to the heart pass unheeded by when committed to the press, however they may have influenced the auditory that has listened to their powerful energy. Forcible as these sermons are, they play rather upon the imagination and upon the feelings, than kindle sparks of that devotion which leads to the comfort of the soul. We are too much absorbed by the beauty of the expressions, and, we must use the language he himself employs,—"most of us, on reading such productions, feel they are presented by bright confusions rather than sober and sacred truths. Like broken sunbeams reflected from below the surface of ruffled waters, are the mental gleams and glances which genius gives forth on such occasions." To the termination of the fifth sermon we would direct the attention of our readers as a specimen of the high capabilities Mr. Montgomery has for reasoning acutely, correctly, and happily, when he does not give way to the natural poetic impulse of his mind. His observations on the influence of the Church of England, on the intellectual fever of the age in which we live, and the benign agency of that establishment in the chastening and controlling it, are admirable, and exhibit the expansion of his intellectual faculties.

The Battle of Loncarty; an Historical Poem, in ten Cantos: and the Retired Lieutenant; a Poem. By JOHN LAKE, Author of the Comedy of "The Golden Glove," &c. London, E. Churton, Hollis Street, Cavendish Square.

With the mass of the public, poetry is at a discount; it is scarcely fashionable to countenance it, though the works of the *pets* of the day may be found on the boudoir and library table prominently displayed. But the present age, boasting of its light, and wit, and talent, and in which every branch of science and art is advancing rapidly to an unheard of state of perfection, should not neglect poetry. The votaries of the muses ought not to be allowed to pine in obscurity, and, too often, it is to be feared, in want; or, whatever we may think of ourselves, future generations will judge but slightly of our taste, when they see before them the works of the neglected bards of our time amongst those which have almost been consigned to this indiscriminate neglect. Mr. Lake's poems are written throughout in the graceful and easy style of Parnell, Gay and Goldsmith; from such models the author appears to have formed his taste. The latter poem, in particular, reminds us of the halcyon days of British song. "The Battle of Loncarty," embraces the portion of Scottish history at the conclusion of the reign of King Culen and the commencement of that of Kenneth III., the former of whom was slain by Rodardus, Thane of Methven, for an outrage against his daughter. It shows the state of the kingdom, resulting from a licentious court and government, the invasion of the Danes, their overthrow through the heroism of the Hays, together with the singular mode in which the latter were rewarded. These are the leading historical facts upon which Mr. Lake has founded a very spirited epic, in which the incidents are well developed, and the interest does not flag throughout. The lovers of story will find in it as great a treat as the lovers of poetry, it being ornamented with the usual incidents of chivalrous romance, a tournament, plots, a nunnery, disguises, surprises, carousals, and a love episode.

We conceive that Mr. Lake has a peculiar claim upon the gratitude of his native country, in so poetically illustrating an interesting and important period of her history, and it is not to her honour that the work is, comparatively speaking, unknown to her, and the British public generally. It, however, affords us much gratification to learn that the author has privately met with the warm patronage of more than one of the most distinguished of the aristocracy; this reflection must give him much pleasure, though it is but a small gratification to a poet amid general neglect.

Mr. Lake has thrown this poem into the form of a tragedy, and we have been favoured with a perusal of the MS. It is to be regretted that such a work should not have been represented, for it possesses in our estimation all the essentials that would render a play successful.

We can only briefly allude to "The Retired Lieutenant." Halbert Guise, having amid much hard service scraped together sufficient to purchase a cottage "at Walford, on the northern road," and, being

——————" broken every way
" Retires upon his broken pay,"

and takes up his quarters in it for the remainder of his earthly campaign. Here he obtains a housekeeper, "a female blanch'd by age and cares," and forms acquaintance with some, who, like himself, are overflowing with goodness of heart and virtue. From the neighbouring baron and his lady he receives some civilities; the former of whom obtains his company for him, and, now Captain Guise, he is ordered to London to be re-instated in active service. This change of fortune to one whom the world had worked its worst, and who had subdued his ambition and youthful hopes, disturbed the calm serenity which seemed to have been destined for his latter days. The excitement brings on a fit from which the veteran never recovers.

Every sentiment in this little poem is marked with a manly and wholesome morality; and its interest rests on the fidelity of its touches to nature, and the pure and affecting moral to be drawn from the whole piece. There should not be a soldier's library or knapsack without a copy of it.

Rome, as seen by a New Yorker.—WILEY & PUTNAM.

We are much pleased with this unpretending description of the feelings of an inhabitant of the United States, on his visit to the eternal city. There is no attempt at fine writing, but we have a plain unvarnished narrative of the author's observations and reflections. He was in Rome during the Christmas week, and describes the ceremonies of the church with great good taste, without, on the one hand, hurting the feelings of those engaged in what they believe their sacred duties, or on the other disguising his own opinions of their importance. To the inhabitants of New York, his book must prove a useful guide, for in speaking of the relative height or position of public buildings, he takes the edifices and localities of that city as his points of comparison. He appears, more than once, to have been the subject of much astonishment to the Romans, who could not completely understand that Americans were not black, and had all the characteristics of the Negro. We are quite satisfied that our author has taken home enough to occupy his thoughts during the remaining period of his life, and that he has shewn his good sense in inspiring his countrymen with a desire to visit a city which adds so much to the intellectual enjoyment of those who have visited it.

The American Journal of Science and Art, by PROFESSOR SILLIMAN and BENJAMIN SILLIMAN.—New Haven.

IT is to be regretted that this periodical is not better known in Europe, for it has claims to the highest standing amongst those scientific productions, by whose means accurate and useful information is disseminated. Although eighteen volumes have been given to the public, replete with matter of great value, and is highly estimated in the United States, it has found but little encouragement in England, and is only to be seen on the tables of our first institutions. Original papers, discussions on the best contributions in the European journals, bibliographical notices of new publications, all written in an agreeable style, and, generally speaking, in popular language, are the characteristics of this publication. It is published quarterly. The contents of the number of the last three months afford an admirable specimen of the way in which the work is conducted; geology, crystallography, botany, astronomy, and chemistry has each some portion devoted to it. The first article on the Valley of the Jordan and the Red Sea presents us with materials for the geologist and the historian; the topography of the Holy Land requires such examinations as Mr.

Sherwood has undertaken. The violent catastrophes which have overthrown the ancient cities of the east are dependent upon physical causes, which require knowledge of the geological phenomena of that interesting country, and such contributions to our inquiries are most important. A paper, by professor Baillie, of the United States Military Academy, shews us that the subjects which excite attention here are not unnoticed. The object he has had in view is to give his own observations and experiments, illustrating the information appended to Lindley's Botany, by Mr. Luckett, on the crystals which occur, spontaneously formed, in the tissue of plants. The magnetical investigations of Scoresby—Dr. Mantell's Medals of Creation, are carefully and judiciously examined. Dr. Smith's Quarterly Abstract of the Researches of European Chemists deserves especial notice, for it embraces most of the striking features of the progress of that science. We most earnestly recommend this Journal to the various book societies, and to all those who wish to keep pace with these eventful times, when, daily and hourly, new discoveries are made, or old objects placed in a new view.

WEALE's *Quarterly Papers on Engineering*.

We have had so often occasion to extract from Weale's valuable work, that we hail, with no small pleasure, another addition to our sources of information, on subjects which daily contribute to the comfort and well being of society. The sixth part of volume the third contains—1st. A Memoir of the Thames Tunnel, by H. Law, C. E., embracing short sketches of the attempts to construct tunnels at Gravesend and at Woolwich, and a history of the present tunnel, with a description of the operations for sinking the Rotherhithe shaft, illustrated by engravings.—2. A paper by J. Neville, C. E., on the cross sections of roads in Ireland.—3. A translation of Peclet's Treatise on Heat.—4. On the process of the manufacture of bricks and tiles in Holland, by Hyde Clarke, Esq.

THE SOCIETY OF BRITISH ARTISTS.

THE twenty-first exhibition of this society opened at their rooms in Suffolk Street, on Easter Monday. The collection numbers upwards of eight hundred paintings, of which about one hundred and fifty are in water-colours, and about a couple of dozen of casts. Amongst all this vast assemblage of pictures, though there are many pretty pieces which will run a good chance of selection by prize-holders in art-unions, there is not one which aims at the higher department of art. Pieces of drollery and caricature and landscapes predominate; there is also a plentiful sprinkling of studies of heads, and fancy and poetical subjects; but none of them imbued with the nobler soul of art. In the manipulatory department also, particularly in colour, we are sorry to perceive little or no symptoms of advance amongst our artists; on the contrary, in addition to the the absurdities which we have been long accustomed to be favoured with, the fruit of the exuberant and untutored fancy of individuals, we have now harsher and still more obnoxious crudities resulting from an ill-considered imitation of certain foreign schools, the dogma of which seems to be that breadth and effect are to be produced by the rude opposition of the brightest and most strongly contrasted colours, aggravating rather than softening down the asperity of an originally hard outline. We hope this unsatisfactory state of things is not much longer to continue amongst us. Let us endeavour to establish a school of colouring founded upon a definite system. Harmony in colouring, chiaroscuro, and the proportions of light and shadow proper to be mixed in a picture according to circumstances, are all matters capable of being settled upon principles analagous to those which regulate harmony in music, and the proportions in architectural works. With these few general observations we proceed to mention a few of the works which struck us pleasurably in the present exhibition.

Clint's coast views, though a little too cold perhaps in their general tone, are all done with a delicacy of outline, and a mastery of perspective which command attention, and convince us of their being original and accurate copies from nature. We have no less than nine of these pictures in the present exhibition, all of which deserve inspection.

Boddington has a goodly number of his cool refreshing landscapes; and Pyne is equally in force in a similar line.

E. J. Niemann has three landscapes, and although, in all of them, the want of a matured knowledge of art may be clearly detected, what perhaps is a great set off to this,—only to be acquired by a patient study of nature in her every mood,—is the "*truth*" both in general character and detail presented in each work. The handling of this artist is that of a master, but we would caution him—inasmuch as he deserves it, to guard against the seductive and meretricious effects produceable by "*trick.*" The gifts of good judgment, both in colour and arrangement, have fallen to his lot,—and with care he may take a high position in the line which he has adopted.

Prentis amuses us with several of his little playful sketches, two of which possess considerable character:—namely, No. 41, "Materials for a future Page," a lubberly lad about to be installed into his future livery, and No. 533, facetiously entitled

"Good morning, Sir!" and representing a drunken sot returning at early morning to his house, which he finds shut up, and placarded "to be let, apply next door."

Mr. Woolmer, whose lavish extravagance in colour is painfully apparent in the rest of his productions, has a very pretty picture of "Dorothea," in which the figure is most naturally and gracefully disposed, and the general effect very pleasing.

SOCIETY OF ARTS .

At a numerous meeting on Wednesday, a new patent machine was exhibited for the manufacture of "artificial teeth, gums, and palates," the invention of Mr. Tomes, surgeon-dentist to the Middlesex Hospital. The object sought is to attain the greatest possible accuracy in the fitting the substance used for the artificial teeth upon the gums and palate; which accuracy, if secured, would at once obviate the inconvenience and pain so often now complained of, and the apprehension of which deters so many from availing themselves of a necessary substitute for the losses of nature. A *reverse* of the mouth is made by means of casts, in a peculiar composition of Mr. Tomes', over which a tracer is made to pass, guiding in its progress a cutting drill. The drill operating on the substance to be used for the teeth (the best being hippopotamus' tooth, or "dentine") produces an almost *mathematically* accurate copy. Indeed it was curious to see, in some specimens on the table, the fidelity with which the minutest irregularities were transferred from the model to the copy. The use of gold, rendered necessary from the more uncertain fitting (with existing means) of the far preferable "dentine," will probably soon be discontinued. Many can, with comfort, wear this natural bone whose mouths become excoriated by gold. A very interesting detailed paper on the subject by Mr. Tomes was read, which drew forth the encomiums of the eminent medical men present. It is considered the most important step that has yet been made in this peculiar art.

MISCELLANEA.

BILL FOR PROTECTION OF MUSEUMS.

The Solicitor-General has brought into parliament a bill which will, probably, prevent a recurrence of the disgraceful acts which have deprived us of some of our works of art. It appears that the Portland vase will be restored.

THE LOUVRE.

The annual exhibition of the works of French artists has attracted its usual share of attention; criticism both severe and kind has, as is ordinary, been lavished upon the various artists. All agree that the most striking painting, if not the best, is Horace Vernet's Prise de la Smahla d'Abdel Kader à Taguin. It is the largest painting in Europe, and upon it has been bestowed labour, time, and local knowledge. Its length makes it somewhat difficult to embrace all the different objects presented. It is rather to be called a phenomenon than a painting; men, women, animals, are crowded together upon the canvass; its details are so numerous that it requires a lengthened study fully to comprehend them; a drove of oxen rushing in confusion from the battle, a charge of cavalry, an Israelite carrying off bags of money, groups of warriors, all form portions which are pictures in themselves. In this extraordinary performance are concentrated all the beauties as well as the defects of this great artist. In about nine months he completed this chef d'œuvre, which must add to the brilliant reputation he has so long enjoyed. Numerous as are the historical painters who began in the collection, few of them exhibit any striking talent. The Battle of Hastings, by Debon, is the most attractive. Portraits are, as usual, most prominent.

WYLD'S POST MAP OF EUROPE.

This is by far the most valuable companion the continental traveller can have. It embraces the best means by which he can take his route throughout Europe. Every thing is clearly and carefully laid down. Railroads now in operation, as well as those in contemplation, are marked out, and the post roads which communicate with them given. Nothing has been left undone for the accommodation of those who require a knowledge of the roads of Europe, and no one should start on his journey without taking with him Wyld's map.

RAILWAY METROPOLITAN TUNNEL.

This new project begins to be seriously entertained: the prospectus before us points out its practicability.—"The objections against subways under the metropolis have been the darkness and the noise, as well as the damp and unwholesome atmosphere, and the difficulty that the deeper the sinking, in order to obtain a good stratum, and avoid foundations, sewers, and other obstacles, the greater the evil of ascending and descending steep passenger shafts. These difficulties, it is supposed, are to be overcome in this advanced state of engineering. It is intended to commence such a railway by intermediate stations at each chief thoroughfare. Commencing at Hyde Park Corner, there would be stations at Regent Circus, Charing Cross, Waterloo Place, Temple Bar, Farringdon Street, the General Post Office, Bank of England, and the Blackwall Railway. At each of the above stations a street frontage is proposed. The passengers would get into the carriages at the level of the ground, and gradually descend to the requisite distance beneath the surface for avoiding all obstructions, into the hard dry blue London clay stratum, and again rise to the surface at the next station. An accelerated velocity would be obtained in starting, and a retardation when coming to a station. The material of the London clay is well understood, and contractors of responsibility will undertake the work at the engineer's estimate. The works will be precisely similar, and quite as certain as the tunnelling on any other railway. Wooden railways, with atmospheric or other stationary power, which would prevent the noise and disagreeable effluvia arising from the gases generated by locomotive engines, will be employed.

The fact of the stations being on the surface, and but a short distance from each other, would ensure a sufficient degree of light; should this not be the case the tunnel would be lighted by lamps, and become not more objectionable than the railway tunnels under the town of Liverpool, or the present Thames Tunnel. Indeed it would form an arcade, perfectly well ventilated, from the frequent passage of trains acting like pistons upon the air.

NEW THEORY OF THE UNIVERSE.

Mr. Brandt, of the Universities of Berlin and Rostock, has translated from the German of Schmitz his work entitled "The Cause of all Motion in Nature." On the first appearance of this volume in Germany, it produced a sensation among all classes, and it bears eminently the stamp of transcendent genius.

In his Introduction, the author points out how erroneous are the systems which have reigned paramount in natural philosophy, built up on mere hypothesis and fancy. He shows that nature suffers herself to be explained by herself alone, and not by abstract and arbitrary science, and that by adhering to this method he had arrived at the discovery of truth. While hesitating to admit much that Newton has promulgated, he yet defends that great philosopher against his interpreters (or misinterpreters) who have cried up his system of attraction to an extent that Newton neither contemplated nor wished. "I do not hesitate," says Newton, "to propose one simple principal power, in connexion with two or three causes, which evidently moves the whole of nature, though I must leave the discovery of it to posterity." The object of the present work is to show that this discovery is already made.

In his first section, entitled "Natural Logic," the author lays down the unerring axioms of nature.

In the second section, the primitive element of the universe is treated of, and the different forms under which matter is perceptible to our senses come next under consideration. Reserving the word "matter" as a denomination for all else, he chooses the denomination of "element of warmth," to designate that invisible and finest fluid, which might as well be designated ether, electric fluid, element of motion, of life, &c., which we perceive in electricity, in lightning, in the emanations, the result of combustion, which render themselves perceptible by the feeling of warmth, &c., and which strives to spread itself equally throughout the universe. The author goes on to explain all phenomena of matter as effects of the tendency to equilibrium of the element of warmth, and its consequent capability of penetrating and dissolving bodies, and separating them into atoms, and that absence of the element of warmth is coincident with the approximation of atoms (condensation and solidification); that in fact, there is nothing in the universe but atoms, and the element of warmth; that a vacuum neither exists, nor can exist—that no power of attraction or gravitation exists, but that its apparent existence is only the result of the tendency of the element of warmth to equilibrium—that the universe consists of planetary systems, in the centre of each of which is a "sun"—that the suns are the places of highest combustion (nourished by the matter dissolved into gases by the operation of the element of warmth) of the greatest expansion of gases, and the greatest dissolution of matter—that the rarified gases rise in a spiral direction, their motion producing that of the planetary bodies, and that the atoms are sent back again from the sun in beams of light.

Among the chief topics of the work must be particularly distinguished the demonstration of the "sinking motion,"—the natural effect of the operation of the element of warmth. The author brings forward twenty-eight phenomena and observations to prove, that the planets gradually sink to the basis (the outermost boundaries) of the solar systems—that the earth, as well as all other celestial bodies, have derived their origin from their sun—that the earth, gradually sinking or receding from the sun, at the rate of about fifteen geographical miles daily, gradually increases in density, and will, eventually, become a fixed star in the firmament—that all satellites continue to approach their principal planet, and, accordingly, a period will arrive when the moon will touch the earth, the two afterwards lying contiguously (as double stars are observed to do), and that two or more bodies meeting each other cannot again separate.

THE SOCIETY OF BRITISH MUSICIANS.

The Society of British Musicians have reached the termination of the second series of their eleventh season. The perseverance with which they urge their claims to attention is beginning to make a proper impression upon the public. The internal and external difficulties of their position have been many and perplexing, and have occasionally put in jeopardy the existence of the Society itself. Happily, however, a sound feeling of interest in the success of the cause has prevailed over every other, and that tendency to *exclusiveness*, which at one time menaced the society with subversion, has been succeeded by an united co-operation. Another source of embarrassment is, and, to a great extent, always must be, the difficulty of securing the united services of an adaquate number of performers. This difficulty is a bar to the produstion of any extensive compositions, which involve the necessity of orchestral or choral assistance. Hence it follows that this Society, which might be a stronghold for the nobler aims of the art, the demands of which are at present unheeded by the public, (or, rather, we should say, wholly sacrificed to the creature-worship of those whose chief if not sole element of art is their power of astonishing,) finds itself crippled in its resources and confined to such classes of composition as require least external aid. It is unreasonable to expect professors, however well-disposed towards each other and to the common cause, to make frequent sacrifices of their time to so unproductive an object as the Society of British Musicians have proved. We cannot conceal from ourselves the fact that there has been great neglect of the common good, or a happier state of existence would have arrived to this Society, to which the high and valuable patronage of their Majesties the Queen and the Queen Dowager, and of her Royal Highness the Duchess of Kent, has already been extended. It would not become us here to offer in detail those suggestions which occur to us as likely to aid, if not necessary to maintain this Society, but we cannot refrain from urging upon its attention that this patronage, so elevated and so influential, has been too long allowed to remain inoperative. Art, and espeecialy high art, is naturally dependent upon the protective patronage of the superior classes of society. Musicians need only to turn their eyes to the Continent for a corroboration of this assertion. The populace may nourish the fame of a *Balfe* or a *Jullien*, but when did they ever foster a *Mozart*, or sustain the aspiring aims of a *Beethoven*?

- "Quorenda pecunia prinùm est." Funds must be raised, and those funds must be *wholly* devoted to the service of the society. Whatever profit may be derived from its concerts must be consecrated to the art. Amateurs, the most distinguished for good taste, must be invited to afford their co-operation upon all committees of trial, in order that the judgments delivered may be clearly derived from an unprejudiced tribunal. To these two great and vital points the society must bend its energies. We feel assured that invitations to those patrons of music whose names are too familiar to all professors to need further indication from us, urging the claims of the society would not be made in vain. As at present constituted, the committee of the Society of British Musicians have a most difficult and delicate task to perform: however honourable their motives, however unbiassed their decisions, they are still the verdicts of professors; who, as assessors to an independent tribunal of *cognoscenti*, would find their functions freed from embarrassment and their opinions far beyond suspicion. That such an independent jurisdiction might be formed, we feel the utmost confidence; and our advice to the society would be, that it should seek to obtain it before the recurrence of the next season. Meetings, such as those to which the society has lately been limited, should be held accessory to a fixed number of concerts upon a larger scale: arrangements should be made to secure at them enough performers to fill all the parts of a score, so that a trial of overtures, symphonies, and portions of oratorios or operas might be made, as well as of concerted pieces for instruments. The excellence of many of the works of those who constantly contribute to the society's concerts, warrants the supposition that many compositions of higher aim are suppressed by the want of orchestral resources. The amateur should be made to feel it his duty to come forward in their behalf. It is not with the conception of the musician as with those of the painter; the latter needs, indeed, the fostering warmth of patronage, but his creations once exposed speaks for themselves without aid: while, for the full and perfect development of the ideas of the former, the kindly help of many is indispensable. Neither is it to be overlooked that the form of patronage is essentially different as regards the productions of each of these arts. As regards the musician, it must be the result of a love of the art extending far beyond the mere pleasure of an outward sense. The elements of sound musical criticism are much more remote than those of pictorial, in the ordinary sense at least. The aims of those musicians who are likely to fill the ranks of this society, appeal to a judgment founded upon an intimate acquaintance with the works of the greatest masters. Such a groundwork of knowledge is necessary to detect mere imitation, no less than to approve a judicious use of whatever is admirable in them as models. Every thing, then, must be done to divest this society of the aspect of a *conversazione* of its members. In the sister art of painting such a system is applicable, because co-operation is unnecessary for the display of its objects. In music, the contrary is the case; its effects depend for their very existence upon the aid of numbers. The great usurper, the pianoforte, is rapidly absorbing every other class of composition: its powers of expression, scanty and suggestive at the best, are pressed to the utmost: it has superseded the orchestra, even in large theatres and concert rooms, as an accompaniment to the voice—as a reference to the programmes of the past five or six seasons will prove—and it bids fair to monopolize, for a time at least, the ears of the public and the hands of the artist. It is, therefore, the imperative duty of every amateur, worthy of the name, to step forward and aid in the formation and support of a society in which the art may find a home: in which every class of composition may find its refuge and an appropriate exposition: in which he may derive honour to himself, and aid in collecting the laurels of those who have laboured so long and so honourably to maintain the name of

BRITISH MUSICIAN.

THE THEATRES.

IT has been with no small degree of pleasure we have witnessed the revival of those good old times, when Tragedy had her well appointed supporters, capable of giving true effect to those splendid efforts of imagination which those who have preceded us have delighted in. The Princess's Theatre has led the way to a restoration of our former tastes, and has enabled us to witness some of those performances which have for a long time slumbered in peaceful oblivion. Mr. Forrest, of whom we had at first formed a very indifferent opinion, has evinced that he is capable of better things than those he first produced. Remembering, that when he was formerly amongst us he was censured for doing too much, he commenced his second career by running into the opposite extreme. His *Othello* and his *Macbeth* were feeble and tame in the extreme, two or three occasional bursts only reminding us of his former impetuosity, and that his reputation was based upon his possession of physical power. His representation of *King Lear* has shown that he has a correct judgment, much taste, and the good sense necessary to constitute a first-rate actor,—for the possession of a fine voice, of intellectual features, and a well-formed person, are not the sole gifts upon which the actor has to rely. His well-toned performance in *Damon and Pythias* has stamped him as a man of genius, and has much of the classic and the picturesque in its disposition. The play of *Lear*, as now placed upon the stage, is inferior both to the original and to Tate's alteration; it is of a mongrel breed, possessing none of the excellences of either of its parents. Shakespeare's play is, with our present ideas, little adapted for representation, and it has been the fashion to decry that of Tate. At present, a great deal of that which is most objectionable is retained, whilst the least disagreeable is omitted. In the present play the death of *Cordelia* is most offensive; if the love nonsense of *Edgar* is to be substituted for the marriage of *Cordelia* with *France*, there can be no reason for a catastrophe which does violence to the feelings, and mars the beauties of the context. Forrest's conception of *Lear* makes him somewhat too feeble, excepting in his paroxysms of rage; he however delineates the striking traits of his character with great truthfulness and feeling. The curses heaped upon his daughter are given in the same conventional style they have been from the days of Garrick, of which so much has been said, and of which, in our times, Kemble furnished the best example. The least effective scenes were those of madness. Miss Cushman has added to the laurels she has so deservedly gained by fresh proofs of her possession of that innate genius which alone carries with it the feelings and the judgment of an audience. *Mrs. Haller* in the *Stranger* has been performed in a style of first-rate excellence; the contrition of a broken heart, the deep agony which the presence of an injured husband awakens, the fond yearnings for one moment's sight of her deserted children, are exquisitely pourtrayed, and Miss Cushman has come nearer to the excellence we have been taught to admire than any actress of the day. Her *Rosalind* in *As You Like It* evinces much talent, and abounds with beauties; we cannot, however, award it the same meed of praise that we do to those efforts in which the higher passions are called into action. There is throughout her assumption of male attire less of feminine delicacy than we expect, for though there is nothing to offend, there is more masculine manner than we like, and an exuberance of energy. Mr. Graham grows upon his audience; he is a careful student of dramatic art, and will most probably obtain a high position. Easter has, as usual, brought with it its series of entertainments. Drury Lane has given a comic version of Robert Macaire, marked with very little of interest; the Princess's, a magnificent spectacle, founded on one of our old melo-dramas, *Timour the Tartar*, in which are introduced, as is the fashion now, rhymes with puns and hits at the passing objects of the day. The Lyceum, always alive to mirth, has produced *Whittington and his Cat*, which seems by its genuine wit to be likely to keep possession of the stage for some time; nor is our old favourite the Adelphi behind its neighbours, but, determined to keep pace with the spirit of the times, has added to the attraction which Madame Celeste has given in the *Green Bushes, O*, a lively burlesque admirably suited to the taste of the crowded audiences of that favourite theatre.

HER MAJESTY'S THEATRE.

At length the vernal season appears, and with it not only those rural delights which the true lover of the country enjoys, but the city, woke from its apathetic slumber, rouses into life and its enjoyments. The commencement of the Opera is, to the man of taste, the first dawning of the light of his happy days, and he hails with pleasure the first announcement of the season. *Ernani*, a composition of a young candidate for fame, Verdi, brought before us Signora Riti Bono, an artist of considerable merit, possessing a well-cultivated voice, of considerable power, and sufficient sweetness to give effect to what she undertakes. Careful in her execution, attentive to the meaning of her author, never neglecting the concerted pieces, she will always be useful, and obtain much consideration, without reaching any very striking position in the musical world. Signor Boldu, the new baritone, promises well, and his management of *Don Carlos* holds forth some expectations of his becoming a favourite with us. Signor Moriani reappeared amongst us, as did Signor Fornassari, both of whom have gained deservedly their share of reputation both abroad and at home. If there was no striking improvement in either of them during their absence, there was no reason to find any diminution of their respective talents. *Ernani* has many opportunities for the display of the powers of those who support it, and though we trace *Il Puritani*, *Norma*, and other of our favourites, yet there is sufficient originality, in these days of concoction of operas, to stamp it with a character of its own. It is in the concerted music that the greatest power is displayed; the sestett at the end of the first act is the most effective of the pieces, and is the best proof of Verdi's talent. *La Dryade*, the ballet, owes its charm to Lucile Grahn's tasteful cleverness, Perrot's personation of a love-struck gnome, and to a better train of subordinate danseuses than we have for some time seen at the Opera. We trust that the first promise of the season will be fully sustained, and that we shall have occasion to congratulate Mr. Lumley on his successful career.

GLASS-MAKING IN ANCIENT EGYPT.

A STRIKING fact is proved by the extant relics of the glass manufactures of ancient Thebes in the British Museum, as well as other museums, and by the illustrations of Rosellini (copied from the Tombs of Thebes) of the laboratories of the glass-blowers, and the workshops of the glass-manufacturers of Thebes, during the early eras of the eighteenth dynasty (1700 or 1600 B. C.)

It exposes the error of the ordinary ideas indulged by historians and antiquarians on the subject. It is common to assert that, with the exception of some glass vessels at a great price, glass was little known, and little used, till the time of Augustus, and was never employed in windows till after the fall of the Roman empire. The circumstance of pieces of glass of good manufacture having been found at Pompeii ought to have thrown light upon this allegation, derived from an ambiguous assertion of Pliny. The fact is, that glass and porcelain, of an equally good quality as that in common use in modern times, was made sixteen or seventeen hundred years A. C. in Upper Egypt. It appears, also, to have been made in profusion. This is a second allegation, supported by adequate proof. But a third, of a more startling character, has been added. It is affirmed that the glass-blowers of Thebes were greater proficients in their art than we are. They possessed the art of staining glass, which, although not wholly lost, is comparatively but little known, and practised only by a few. Among the illustrations of Rosellini is a copy of a piece of stained glass which was found at Thebes. It comprises various colours, which he describes as struck through the whole vitrified structure, and refers to other instances of ancient Egyptian stained glass which he has seen, in which the coloured design is equally struck through squares of glass an inch thick, thoroughly incorporated with the vitreous structure, and appearing the same on the obverse as on the reverse side. It was in consequence of being aware of this fact, that Winckelman asserted that the Egyptians of the eighteenth dynasty brought the manufacture of glass to a much higher point of perfection than ourselves. In fact, after the decline of the art, Egypt became to Rome what Venice became afterwards to Europe. The greater part of the supply of glass in his time, was considered by Pliny to derive its good quality from the ashes of a peculiar genus of kelp, growing in abundance by the Lake Mareotis and the Red Sea. That kelp, reduced to a kind of green ash, is represented by Rosellini as brought by the workmen in baskets to the glass manufactories, and also to the potteries, where a vitreous process was evidently employed for the purpose of glazing the earthen vessels. It would appear, both from proofs that remain and cotemporary records,—provided full reliance can be placed on the latter,—that Winckelman's somewhat startling allegation comes very near the truth. The Egyptian glass-blowers and glass-cutters of Thebes imitated amethysts, rubies, and other precious stones, with wonderful dexterity, and, besides a great proficiency in the art of staining glass, to which reference has been made, must have been aware of the use of the diamond in cutting it and engraving it. In Mr. Salt's collection in the British Museum, assignable to the era of Thothmes the Third, there is a piece of glass beautifully stained throughout, (like that described by Rosellini,) and skilfully engraved with his heraldic emblazonment, precisely on the principles of modern heraldry; or, as the double oval shields containing the names and titles of kings have (for some reason unexplainable by Champollión) been called, "*cartouches*." The profusion of glass in ancient Egypt is attested by several trustworthy authorities. The historical relation that the embalmed bodies of Cyrus and Alexander were deposited in glass coffins in Egypt has been, indeed, considered as a fable; but it may be said to be analogically proved by recent discoveries of portions of granite sarcophagi which are covered with a coating of stained glass, through which the hieroglyphics on the stone appear. Diodorus Siculus says, that entire coffins were commonly made of glass in Upper Egypt. This would demonstrate an extraordinary profusion; but certainly an equal of the dearest glass manufactures may be practically proved. Vast numbers of imitative precious stones [a], in glass, made by the jewellers of ancient Egypt, are to be found in all the museums of Europe. Among them are false emeralds of considerable size, in which the artisans of hundred-gated Thebes appear to have principally excelled. There is little doubt that many of the large emerald basins used in the early Christian churches were of their manufacture. The extensive character of the manufacture may further be inferred from a circumstance recorded by Pliny, that in the Temple of Jupiter Ammon there was an obelisk of emerald, that is to say, of glass in imitation of emerald, sixty feet high. The emerald hue which the glass-manufacturers of Egypt gave to glass appears, from chemical analysis, to be imparted by oxide of copper, and the reds used on ordinary occasions in staining plate-glass appear to have been given by minium. All these facts prove the extensive knowledge of chemistry among the natives of old Thebes. Glass bottles, (quart bottles?) nearly similar to our wine-bottles in colour and measure, though in shape resembling the wide-mouthed bottles used in preserving fruit, may be seen in the British Museum, and are found in abundance in other European cabinets.

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[a] Real precious stones, natives of India, and brought doubtless by the alleged railroad from Cosseir in the Red Sea, (amethysts, hæmatites, and lapis lazuli, and a species of topaz,) are found in the tombs of the era of Thothmes the Third.

A remarkable fact connected with the manufacture of ancient Thebes 4,000 years ago, shows the traditional tenacity of ancient custom. It is well known that the oil-jars of the Levant are precisely similar to those which appear in the illustrations of Rosellini. So the Egyptian earthen amphora, without feet, adopted afterwards for strong wines by the *bon vivants* of Rome, retain their original shape and purpose among the Tuscan farmers. With reference to glass bottles, there are two classes used at the present day of equally ancient origin: these are the Florentine oil-flasks, holding about three-quarters of a pint, and the turpentine carboys, as they are called, holding four or five gallons, from Cyprus and the adjoining shores of the Levant. Both are protected by matting, the first of a fine, the second of a coarser nature. Both are seen, with slight alterations, in the illustrations of Rosellini. Sir G. Wilkinson thinks that glass lanterns were used by pickets of soldiers, and gives a specimen of a group of Egyptian sentinels carrying a lantern on a curved pole. It is not improbable that an hieroglyphic on the Rosetta stones, translated *manifestation*, resembling a magic lantern with a handle, from which rays of light are issuing, may be something of the kind. That the glass-manufacturers made magnifying lenses is clear from Plutarch, (*de facie lunæ*,) Diodorus, and Ptolemy, the astronomer, and is proved by the extant cameos, which could only be cut by the aid of a microscope. But reverting to the subject of lanterns, it is probable, though it cannot be gathered from Pliny, that the lamps employed for yearly illumination at the Saite festival—a custom transmitted from remote ages to modern China—may have been of glass. The Egyptians, in the time of the eighteenth dynasty, appear to have used coloured lanterns, like the modern Chinese, on the latter as well as ordinary occasions. Indeed, the modern people of Cairo use coloured lanterns of striped gauze strained over a wire frame, after the Chinese fashion. But they are cylindrical and less florid and various in their decoration. The singularity is, that in the illustrations of Rosellini precisely similar cylindrical lanterns of coloured gauze are seen in the hands of the running footmen and attendants on the grandees of ancient Thebes, when in the act of lighting their masters home from their evening banquets or *fêtes champetres*.

In conclusion, it may be remarked as a singular circumstance, and which applies as well to other manufactures, (such as the potteries, metal founderies, the tanners, the turners, the dyers, and the hand-loom weavers,) that the initial process of glass-making retains its primitive simplicity. Now, as 4,000 years ago, the blow-pipe, shod with iron and heated red-hot, is inserted into the melted glass. In the ancient manufactories, workmen are employed in bringing the "frit" in baskets, for the purpose of vitrification. There can scarcely be a doubt that this frit is a combination, as in Venetian glass-making derived from Egypt, of kali, from the ashes of *salsola communis*, or kelp, and a particular kind of sand. But this paper ought not to conclude without some more distinct reference to the chemical knowledge displayed in the more elaborate processes of glass-making. There are many striking examples of this proficiency in the new Egyptian room at the British Museum. But we will take the single instance of the tablet of stained glass found at Thebes, and of which Rosellini gives the illustration to which reference has been made. The design, as has been stated, is tasteful. It consists of a quadruple star, with a rose in the centre, and with foliage on the angles. Blue, yellow, red, and green colours are introduced, and they are struck through the body of the glass. In order to produce this effect of glass-staining, oxides of cobalt, or of calcined copper and zinc, must have been used for blue, oxide of silver for yellow, and oxide of copper for green. The ruby colour of the rose, that colour of which till lately we had lost the art of imparting, must have been given (as well as the rich purple hue of some of the fictitious gems) by the oxide of gold.

This proficiency may appear extraordinary; but indeed, the richly-painted walls of the temples, palaces, and tombs, where the unmatched colours remain as fresh as when first laid on, show not only a perfect proficiency with the mineral pigments, but a perfect use of the metallic oxides in their composition.

It as easy as invidious to ascribe these applications to unintelligent accident or experiment, rather than to high proficiency in chemistry. Evidences, drawn from all the other arts and trades, prove that the ancient Egyptians, in the earliest times, were skilful chemists; and why should we deprive the land of Cham, Chemosh, and Chemonis, from which the name and art of chemistry—as well as alchemy, its foster-parent—was derived, of the just tribute due to its original study, discoveries, and inventions?

> Quid feret Illiæ
> Mavortisque puer, si taciturnitas
> Obstaret meritis, invida Romuli?

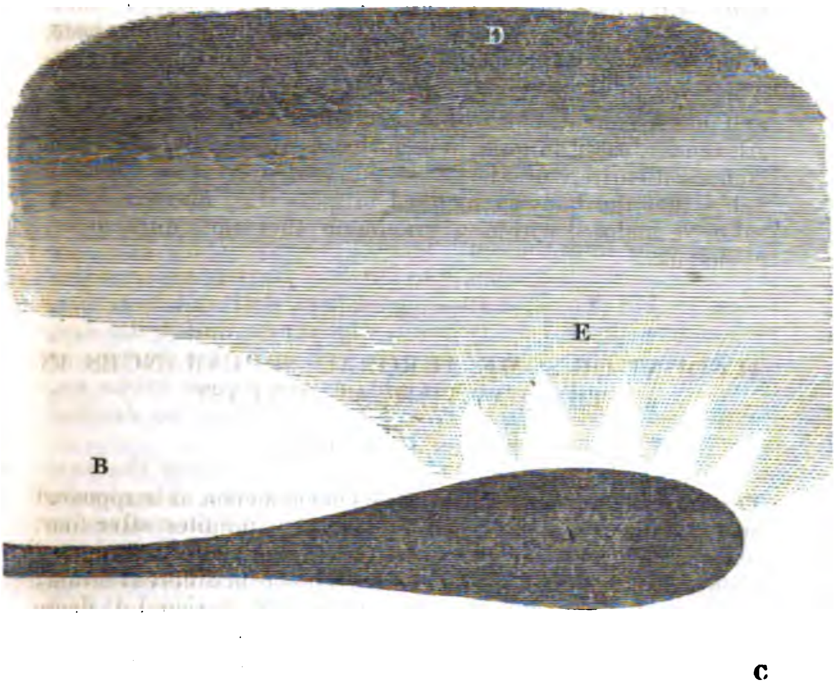
Note.—Winckelman, on the Arts of the Ancients, has some observations on the ancient manufacture of glass, which may be conveniently added. Pliny attributes the discovery of glass to some Phœnician mariners, who, having kindled a fire on the beach for the purpose of cooking, placed their utensils on blocks of nitre. The fire melted the nitre and the sand, and produced a vitrified substance, which improvement converted into pure glass. The Tombs of Thebes demonstrate that 4,000 years ago the manufacture of glass was well known to the Egyptians. The frescoes exhibit glass-blowers forming bottles and vials of green glass. The specimens of Egyptian vials in the British Museum are by no means inelegant; they have long necks bulging towards the bottom, which, when filled with any liquid, would be much less easily subverted than the vials in common use amongst us. Pocket-bottles, cased in leather, such as are used in sporting, for containing spirits or liqueurs, are amongst the curious relics of the Theban glass manufacture. It is clear, from specimens that are left, that the ancient Egyptians knew how to make casts in vitrified materials, and to counterfeit in glass the amethyst and the emerald, with a degree of success unequalled in any country. Nor were they unpractised in the ingenious process by which the representation of a bird or flower may appear to be imprisoned within a piece of glass, so as to form part of its own substance. It appears that they constructed the device from filaments of coloured glass, in the first instance; it was then covered with transparent laminæ of glass, and all were fused together with so much skill that that no joinings in any part of the work can even now be detected by the most powerful magnifier. In these specimens the coloured device appears as perfect on one side as the other. Figures of birds were thus composed; and if cut through at intervals, each portion so divided contained in itself a perfect copy of the bird. The celebrated Portland vase was long supposed to be a real sardonyx; but it is now known to be formed of layers of purple-coloured glass united by fusion. By similar superfusion, the glass pieces used in the mosaics on the vaults of the domes at Venice have been enabled to preserve unimpaired their original colouring and gilding. A small diamond of the glass mosaic was gilded in the usual way, and then thinly coated with the vitrified material while in a state of fusion. This was an Egyptian art. The gold colour and device appear incorporated with and struck through the body of the glass, so as to appear the same on both sides. An Egyptian sarcophagus of granite may be occasionally seen cased over in the same manner, in order to preserve unimpaired the sculptures and legends engraved upon the stone. To the eye of an ordinary observer, several necklaces, scarabæi, brooches, and small ornamental figures in the cases of the New Egyptian Room would appear composed of precious stones. They are, in fact, at least the great majority of them, composed of glass throughout the whole substance, or of materials covered with a glass coating. The tasteful coloured networks of glass bugles with which the wrappers of mummies were decorated were made of the same materials, and are remarkable as being identical with similar ornaments made into bracelets, headbands, and waistbands, by fair dilettantis at the present day. With reference to the larger examples of vitreous superfusion to which reference has been made, a sarcophagus of this description was found by Belzoni in the Tombs of the Kings. The historical assertion is well known, and has frequently provoked commentary, that the body of Alexander, cased in gold, was buried at Alexandria, in a coffin composed entirely of glass. If the record be true, it is probable that the body so inclosed in glass was, for protection-sake, re-inclosed within a granite or other more durable sarcophagus.

ACCOUNT OF SOME AURORAL APPEARANCES IN THE DAY-TIME AT BELFAST.

By John Joseph Lake.

The opposite sketch represents this phenomenon as it appeared on the 15th of February last at forty-five minutes after four, P.M. The atmosphere had assumed a most uncommon and unearthly appearance. The clouds reposed in different strata; the lower of which consisted of isolated horizontal dense masses of the class called *stratus*, and the upper (nimbus) spread over the entire face of the sky. The former had not the usual vapoury appearance of clouds, they rather looked like solid bodies floating in water, their edges being perfectly clear, as though cut into form by some sharp instrument. There were two great clouds of this description, one of them to the eastward, and the other to the westward of the town; and, as well as I could judge, they lay parallel to each other, their direction being from N.N.E. to S.S.W. In the above figure, A represents the northern extremity of the western cloud. All round the horizon there was the light appearance shown at B and C, which seemed to be so loaded with watery particles of moisture that it resembled water, in which A seemed to be floating. This light grew rapidly darker upwards towards the zenith, assuming the usual appearance that distinguishes *nimbi*. E represents the auroral appearance arising apparently from the cloud A. I could not detect any motion or flickering in it though I watched it a considerable time, and, in consequence, could not make out whether (supposing it to be electrical and an operation similar to that of the 6th of

October last[a]) the fluid ascended towards the clouds D or descended from them towards A. This auroral appearance did not continue after dark, but the lower clouds preserved their peculiar features above mentioned throughout the evening, and long after the aurora, if it was such, had disappeared. During the night much rain fell.



Auroral appearances in the clouds are very frequent in this neighbourhood, so much so that I have ceased to take a regular account of them. Amongst the various forms they assume may be mentioned one that occurred on the 28th of August last. They were of the class *cirro-stratus*, and arranged in lines crossing each other at right angles, one from east to west, and the other from north to south, and the point of intersection was exactly over the highest mountain in the neighbourhood, Devis or Divis[b]. I observed a similar appearance on the morning of the 13th of October following, which was succeeded by a windy day.

I witnessed a case of auroral cloud in the daytime on the 7th of January last, which was also noticed as an aurora at

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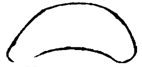
[a] See Polytech. Rev., January 1845, p. 9.

[b] In a former paper, by an error in transcribing, I stated this mountain was 400 *feet* high, instead of *yards*. I find, however, that the latter is not its correct height, it being 1560 feet above the level of the sea.

Edinburgh, as appears by the following extract from the Edinburgh Observer:—"Between nine and ten o'clock the whole of the northern half of the sky was light with a soft white light, and which extended considerably over the zenith towards the south and south-west, even so far as the star Rigel in Orion. The focus of the luminous emanation was situated in the north and towards the north-east, under which point hung the usual cloud of pitchy obscurity observable along with aurora, though the luminousness was so considerable as to give a moonlight aspect to the sky, and to cast a degree of light on northern exposures. There were no coruscating changes of colour, except faintly and transiently in the north-east, at what we have termed the focal point. In the northern heavens, at the same time, a shooting star glanced from a south-easterly direction. The wind, in variable and light breezes, blew from the south and south-east. During the day the barometer fell from 30° to 29° 8′. Next morning it had fallen to 29° 6′. The atmosphere was dull and lowering, with a howling southerly wind, which rose during the day, and at night, to a boisterous gale with rain, the barometer falling to 29° 2′. On Friday night, as the clouds broke up, there was a luminousness in the atmosphere, but no decided appearance of Aurora."

At Belfast I observed this before sunset, during the succeeding twilight, and after it was entirely dark. The clouds, (*cirri-strati*,) very thin and light, had arranged themselves in the direction of the aurora witnessed at Edinburgh, and remained so until it was dark. I was out at seven P.M. and saw them still in the same situation, but so bright that I at first thought it must have arisen from the light of the moon falling upon them; but on recollecting that the new moon was on the following day, I saw that this could not be the case. The greater part of the northern hemisphere was overspread with these clouds, and was brilliant with auroral light. The clouds here, however, had a form in addition to that already noticed, which they had not at Edinburgh, at least it is not recorded. The lines from north-east to south-west seemed like ribs or rests laid along to support arches that extended over from one rib to the next adjoining. I could not discern any motion in them. There were five of these arches; one that passed over the zenith, two to the west of it very distinct and perfect, and two to the east not quite so perfect, being much broken on their western sides. These appearances lasted all the evening, but by ten o'clock the arches were broken up. The luminous appearance, however, still remained, in the form of great streaks of light, from the north-east to south-west. On the following day, as at Edinburgh, the weather was dull and lowering with a southerly boisterous wind.

On the 4th of March last I saw another auroral formation of the clouds at this place, at ten A.M. A dark cloud, in this form, was  stationary near the horizon in the north-east. From the upper side of it the clouds radiated in every direction towards the south, gradually disappearing as they passed the zodiac. The lines of radiation were not straight but waving like ascending flame; no motion, however, appeared amongst them. The wind was from the south, and very gentle. During the morning this appearance gradually disappeared, the clouds ascended and formed in lines from north to south. By four P.M. these lines of clouds were cut off from the east by an arched line from north-east to south-west, to the eastward of which there remained not the slightest vestige of cloud. This form remained till after sunset, when it gradually disappeared.

I am thus particular in recording these various appearances, because they seem to be portions of one great system of phenomena connected with the electric state of the earth. I regret that my leisure will not at present permit me to enter more minutely into making observations and the illustration of the subject; but I hope shortly to be able to take it up. In the mean time I would advert to the fact of aurora and auroral appearances, such as the above, emanating from and being connected so much with the north-east, and their motion towards the south-west, as a strong proof of their being electric phenomena, and of the theory I have propounded of "the direction of the electric currents" of our globe[b]. In support of the former, we have the additional testimony of travellers in the Polar regions, Captain Franklin having observed that the clouds frequently assume auroral appearances there, and also noticed that at such times there were deviations of the needle, which he was inclined to connect with them.

AN ATTEMPT TO EXPLAIN THE MEANING OF THE SIGNS OF THE ZODIAC.

"And God said, Let there be lights in the firmament of the heaven to divide the day from the night; and let them be for signs, and for seasons, and for days, and years."—Gen. chap. i. verse 14.

THAT the figures chosen for the signs of the zodiac had reference to the seasons of the year, which must be regulated by the position of the sun in the ecliptic during the earth's annual revolution round that orb, has been long asserted, and several of the signs have had such explanations attached to them;

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[b] Polytech. Rev., July 1844, p. 22.

but I shall now, in a popular manner, attempt to show that these symbolic signs, taken in succession, may reasonably be explained as emblems answering exactly to the natural phenomena of the seasons, in those climates where in all probability they were invented.

I shall not enter upon the subject of the precession of the equinoxes, and the change in position that has taken place of the equinoxial points in consequence:—neither shall I attempt to investigate when and where the signs of the zodiac were invented; it will suffice to say, that they are of very high antiquity: the discovery of ancient zodiacs sculptured at Thebes and elsewhere, sufficiently indicate this[a], and the mention of some of the constellations of the heavens in the Old Testament, also confirms the fact, that portions of the stars were classed into constellations in very ancient times.

I shall therefore proceed with the constellations as usually placed, commencing with

1. Aries or the Ram.—The power of vegetation in the first swelling of the seeds which are sown in the earth is so great, that even rocks and stones are split asunder and raised up by this force:—and we may observe every day the earth crumbling and giving way above the most delicate seeds as their vitality increases, previous to their appearing above ground. It is at this season of the year, also, that animals usually propagate their species, and then follows the quickening, and the struggling and beating of the young in the wombs of their parents,—both these circumstances may be typified by the sign of the ram—the butting of the heads, which is their usual mode of attack by these animals, signifying the irresistible force of vegetation: and that the ancients considered the ram's head as typical of great power, is shown by their choosing this form for the working end of that formidable piece of ancient mechanical artillery, the battering ram.

I therefore consider this sign as chosen to indicate the phenomena of spring.

2. The second sign, Taurus, or the Bull, I also consider as typical of the continued process of vegetation, the piercing through the earth of the tender shoot, and the raising up and tumbling over of the stones or clods of earth which present obstacles, as the bull tosses with his horns. It may at the same time be representative of the opening of the womb, and it is a curious circumstance, that the Arabic name of the beautiful bright star in the forehead of the bull is (Ul Dhubbur,) or Aldebaran, as we call it, which implies "a hole or aperture."

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[a] The late eminent Sir Stamford Raffles, when Governor of Java, had in his possession a metallic vase or cup, supposed to be of great antiquity, and discovered in Java, having the signs of the zodiac sculptured in beautiful form and relief on the outside.

3. The third sign, Gemini, or the Twins, is certainly indicative of the reproduction of the same plants and animals in continued succession, without alteration of form or properties, for ever by the great fiat of the Almighty.

4. Cancer, or the Crab.—This symbol is certainly indicative of the apparent motion of the sun at the summer solstice, the 21st June, when the sun, having reached its greatest northern distance from the equator, begins to return to the autumnal equinox; but there is another curious circumstance connected with this sign, besides that of the natural forward and retrograde motion of this animal. There are species, such as those common in Jamaica, which inhabit the highlands, and when the annual season for spawning arrives, vast armies of them set out from the hills and march in a direct line towards the sea shore, for the purpose of depositing their eggs in the sand. They continue their direct journey with great perseverance, not going round obstacles, but climbing and passing over rocks and houses, when possible, and having reached their destination, and deposited their eggs, they recommence their journey back during the night, concealing themselves during the day:—and it is very probable that the observation of the habits and instinct of these animals may have led to the adoption of the symbol, as representing the apparent path of the sun between the vernal and autumnal equinoxes.

5. Leo, or the Lion.—The luxuriance of vegetation, and the earth being covered with the crops nearly ready for harvest, affords everywhere concealment for wild beasts, which are thus enabled to approach the habitations of man, and would be thus more dangerous and more commonly observed at this season; and for want of a better reason, I will venture to assume this as an explanation of *the* sign.

6. Virgo,—the Virgin or Gleaner—as she is generally represented with a stalk or sheaf of ripened corn in her hand, is clearly indicative of the season of harvest.

7. Libra, or the Balance, can hardly be disputed as a fit symbol for the equality of the night and day at the equinox.

8. Scorpio, or the Scorpion.—In venturing upon the explanation of this sign, I wish the reader to carry his mind to the consideration of climates and phenomena which differ much from those of a northern residence, such as Great Britain. In the tropical, and just extra-tropical regions of the earth, the phenomena of the seasons, and their productions, are much more regular than with us. The change from a long continued dry to a wet season is almost instantaneous; and in India this is generally so regular, that in the upper provinces the rains, of which not a drop has fallen for months, may with an almost certainty be expected from the 10th to the 15th of June.

I consider this sign of Scorpio to be symbolic of that instinct with which all the animal creation is furnished, which forces them to obey certain impulses; and thus reptiles, and particularly this noxious one, the scorpion, to avoid the effect of exposure to the rains, seeks every kind of shelter and concealment, and creeps into the houses of men, so as to become quite a plague.

I was out on duty with a small detachment of troops, about forty miles from Agra, in the year 1808, in consequence of the village of Polokara, on the banks of the Chumbul River, having refused to pay the amount of the annual collection. The country we were encamped upon was an extensive flat plain, of deep loamy soil, close to the banks of the river, the bed of which, in consequence of the yielding nature of the soil, was from thirty to fifty feet below the level of the country. The hot wind and dry season was just concluding, and we were daily expecting the rains to set in. A short time before this, our tents were infested by great numbers of scorpions; they crept into the tents at night, and crawled up the walls to conceal themselves under the flounces usually attached to that part of the tent. It was dangerous to handle any thing, without caution, that had lain upon the ground; we were obliged to sleep in our boots, and the native soldiery and servants, as well as the cattle, suffered severely from their stings. Two favourite dogs, and two tame pet deer, were stung to death. There was no avoiding the plague, for the loamy soil, from long continued dry weather, and exposure to the direct rays of the sun, was reticulated in every direction with deep fissures, so that it was almost dangerous to ride over the plain. All these crevices and cracks served as so many habitations for the scorpions; they were innumerable in them; the harvest had been cut down, and there was no other cover; and all we could do was carefully to destroy those we found in our tents every morning. We had been two months encamped upon the ground, and had experienced no inconvenience until shortly before the rains commenced, when their natural instinct of the coming wet season urged them to seek refuge in our tents. The rains came in torrents, the fissures in the earth closed up and destroyed many of our enemies, and by a little attention we soon destroyed those that had survived and taken shelter with us. After the rains had continued some days we were free from them. I conceive, therefore, that the sign of Scorpio may have been taken from the very circumstance of these insects and other reptiles abounding and taking refuge at the change of season from dry to wet, as their natural instinct compels them to do.

9. Sagittarius, or the Archer.—I imagine this figure, which is generally represented as a centaur with a bow and arrow in his hand, as indicative of the violent storms of wind, and particularly lightning, which take place at this time, when the rainy season commences. The arrow was the swiftest missile

known to the ancients, and to combine with it the figure of a centaur, I conceive, implied the greatest image of velocity which could be represented by any terrestrial forms at that time known.

10. Capricornus.—This sign, again, is indicative of the apparent motion of the sun in the northern regions, when, having reached the greatest height or distance from the equator, it commences its return to the vernal equinoctial point. The natural inclination of the goat, and its chief gambol when young, being to climb up to the highest point it can ascend, and going down again.

11. Aquarius, or the Water-bearer.—This sign appears clearly to allude to the filling of the rivers and the flooding of lands at the rainy season. It is generally represented by two wavy lines one above the other, as indicative of all terrestrial objects being covered by water.

12. Pisces.—This last of the twelve signs I conceive to be symbolic of a curious phenomenon which often takes place in India and other hot climates. The spawn of fish, and even young fish themselves, having been carried up by water-spouts or other means, occasionally descend in showers from the clouds. These facts have been observed and recorded at Calcutta, Benares, and other parts of India, and may be one of the benevolent orders of the Almighty, by which inland lakes and other solitary waters may be stocked with fish. At Meerut, in the upper provinces of the Bengal Government, of the new cantonments of which I made the first regular survey and plan, a great number of pits were dug in the soil, from which bricks were made, in the dry season, for the public and private buildings. These were perfectly dry, and water was obliged to be brought to moisten the clay to form the bricks. When the rains commenced there was no water in them, but towards the latter end of the rains the waters, which had made them so many pools, were abounding with little fish, and several small fish fell, in a heavy rain-storm, on the roof of the flat-roofed house I inhabited. As the waters dried up, the small fry perished; but they are renewed every year in more or less abundance. I conceive, therefore, that this sign may be indicative of this phenomenon.

Thus, I trust, I have afforded some reasonable explanation, which, in some instances, may be novel to your readers, of the signs or symbols of the Zodiac. Man has only obeyed the fiat of the Almighty, that "they shall be for signs and for seasons, and for days and years."

I am, Sir, your obedient servant,
SAMUEL PARLBY,
Retired Major, Bengal Artillery.

St. George's Terrace, Kensington New Town,
April, 1845.

BUENOS AYRES AND MONTE VIDEO.—ROSAS AND HIS CALUMNIATORS.

By Alfred Mallalieu.

We have found the impression produced by our observations on the state of the affairs of the River Plate to have been such, that we cannot avoid some notice of the brochure which has emanated from the pen of Mr. Mallalieu, and which brings down to the latest possible period a correct and valuable view of the complicated interests which are now forced upon the consideration of this country. As lovers of freedom, as supporters of our commercial system, as followers of science, we are anxious to see the termination of the demoralizing war between the two states of Buenos Ayres and of Monte Video; and we think that this can only be brought about by sanctioning the great policy which has been pursued by General Rosas, and by avoiding a meddlesome interference, which can only annoy one party, without affording the least benefit to the other. Of the present unfortunate position in which Monte Video stands, Mr. Mallallieu has given us the following graphic picture:—

"There were, there are yet, two chieftains contending for sovereignty over the republic of the Uruguay, both without the walls, but the one in close siege of its metropolis, and the almost undisputed master of all the open territory, towns, and population beyond; the other, at the head of a flying guerilla of wild Indians, a vagrant wanderer over the trackless *pampero* wastes of the Upper Uruguay and along the equally desolate frontiers of Rio Grande, without house, or home, or foot of ground beyond that occupied for the day, and ever with his band of followers on the tramp either in search of the means of subsistence, or to escape surprises and attacks by an enemy ever alert and on his trail. The former, General Oribe, was the freely elected President of the State, when the native population could do as they liked with their own; the latter, General Rivera, imposed upon the people *vi et armis* by the French squadron and forces then warring in the River Plate, against Rosas, the President in possession having been ejected by *force majeure*. The rout of Rivera at Arroyo Grande brought another party more prominently forward, a party composed of the residue and refuse of Argentine Unitarianism in exile. Astute and enterprising, the leaders of this party succeeded in enlisting the large population of resident French and Italian immigrants on the side of a government hastily scraped together in a crisis of confusion. About 4000 able-bodied mercenaries, mostly French, were enrolled, armed, and, with the aid of British and other war-mongers, paid—*point d'argent point de Suisse*—for the support of this *tiers* (Thiers if you will) *parti*, under the selected leadership of (as so dubbed for the occasion) one Colonel (!) Thiebaut, a run-away French butcher of Rio Janeiro, and another Colonel (!) Gascogne, a poor French grog-shop keeper of Bahia Blanca; the first of whom is travestied by M. Thiers, the protector and eulogist of both, into a "peaceable man and well instructed soldier;" the latter into "one of the most distinguished merchants of the country, whose fortune may be valued at 600,000 francs." (Speech in the Chamber of Deputies.)

"Such is the party (it would be a mockery to call it government) which now, and since the total rout of Rivera in the battle of Arroyo Grande, has disposed of life and property in unhappy Monte Video. The few native citizens and families which have not been able, or are without the means, to escape, in number estimated at some 4000 souls only, are fast and bound at the mercies of this junto of anarchists, and the band of foreign desperadoes at once its slave and sovereign, which, at free cost and quarters, billet themselves as they will. This reckless party are, indeed, now cutting each other's throats: in the agony of despair they are split into factions, each eager for the last rag and remnant of power—the power to rob—and, with the spoils of robbery as a means of existence, to make off to a foreign land. Pacheco Obes, executioner-in-chief that was for the concern, appears by late accounts to have been so fortunate as, by midnight flight, to have anticipated the *cuchillo* of Lamas, his successful and inveterate rival for the throne of office. Vasquez, the foreign minister, far the ablest, and the most (if not the only) respectable man of the motley government, had thrown up his ministry, and was, according to the same accounts, scheming for a safe exit. But little more was to be got by loans from the "English Company" as so termed. being in fact, I believe, a British and foreign co-partnery of unscrupulous *entrepreneurs*."

These facts, however, have been so constantly misrepresented, that in Europe we have been led to the belief that Rosas was acting the part of a despotic tyrant, goading the innocent inhabitants of Monte Video to madness, and, forgetful of every tie that belongs to humanity, was wading his way to empire through the indiscriminate slaughter of thousands of his fellow beings. No statesman, no general the world has yet seen, has accomplished more for the repose of his native land than has Rosas; even his bitterest foes have acknowledged it. The writer in the Revue des deux Mondes, who has so bitterly attacked the measures of his government, cannot refuse the following testimony to his talents:—

" It is scarcely fifteen years since, under the administration of the *wise* Rivadavia, that it was not uncommon to see the Indians mingle in the public feasts which were celebrated in the city; and when they were asked what they came to do, they audaciously answered, *to carry off women.* You will believe, perhaps, that these women, carried off in this manner, would with difficulty become reconciled to this savage life! Good God! no. You would see them, a few days after, happy in being free, happier still in being naked, accosting the traders who ventured into the interior to traffic with the Indians by their names. This instinct, which carried the society of Buenos Ayres towards the savage state, was then general. No one resisted it; neither men nor women; this was the manner of escaping the persecution of a creditor, the punishment of the law, domestic disagreements, and private vengeance.

" Behold, then, what was taking place whilst Rivadavia, by the statements in Europe, was making civilization flourish in South America!......

" During this period, Rosas had become the most able *estanciero* (proprietor of the province). His probity, intelligence, courage, and indefatigable activity, had given him an unlimited influence over the country: the *gauchos* (shepherds of the country of Buenos Ayres) had acknowledged him as their chief, and placed themselves at his disposal. He organized them for common defence; and it was in this manner that he repelled the Indians towards their deserts, and freed the Argentine territory from their devastations and plunders. But very soon the governors, who could not maintain themselves even in the cities, had recourse to him for putting down the factions, continually springing up, and to interfere in the civil war, which had not ceased to desolate the provinces.

" Certainly, if Rosàs, as it has been said, had only acted through ambition, it would have been easy then for him to have turned to account this state of things. Nevertheless, nothing of this was done: he was satisfied with sustaining public order wherever it was menaced, and protecting the established power without distinction of party or persons. He was not yet the man of politics; he was only the man of authority; but this he wished to be strong, energetic, dominating, and acknowledged by all, because it alone could secure the peace of the republic, restraining all disorder, and subduing all factions. With regard to him, he had so strongly impressed the sentiment of discipline amongst the *gauchos*, who acknowledged him as chief, that in a country where plunder and assassination appeared almost legal, not a thief nor an assassin were to be found amongst his troops.

" The first time that Rosas thought of mixing in politics, was for having a law passed to prohibit the introduction of flour into the confederation. This commerce was carried on with the United States: the purchase of flour absorbed all the circulating specie of the republic, and produced the result of impeding the cultivation of grain in South America.

" You may at present traverse the *Pampas*, rest yourself under the shade of the *Ombú*, whose gigantic branches can cover a whole village, and are the only protection which the traveller finds against the sun and rain; you can penetrate three hundred leagues before you as far as the Andes; ask for hospitality in the *chacras* (farm-houses), from the *estancieros* spread over plains after their cattle: in fine, sleep or travel in security without having to fear a single disagreeable encounter.

" What is, then, the powerful prestige which protects you with its inviolability in a space of many thousand square miles, where a short time ago you could not move without placing in peril your purse or your life? It is the sole name of Rosas.

" It is scarcely twelve years since the government of Buenos Ayres vainly essayed gratuitous concessions of land, in order to attract population, and foment cultivation, along the coasts of the south, from the River Quequen, Sauce-Grande, and the magnificent banks of the Asul until the chain of the Ventana. The land, the possession of which was not then accepted, is sold at present at 35,000 dollars per twelve square leagues, a fabulous price in all America. These secure and pacific coasts are at present covered with cultivation and cattle; because the *Gaucho* well knows that the *mark* of his cattle will be respected in all the extension of the plain.

" While, under the pretext of liberty, in the other American States, the inhabitants murder each other, and annihilate themselves in discord and anarchy, is it nothing to have in so short a time brought peace and prosperity to a country given up without remedy to destruction and pillage? Rosas has obtained it. The means have been violent, and even oppressive, we will concede; but have not so many fatal experiments proved that these were the only efficacious ones that could be adopted? Despot, tyrant, or dictator, what matters the name, if in the end the results be propitious."

The manly conclusion of Mr. Mallalieu's letter to the Earl of Aberdeen cannot fail to produce its effects upon all those who have watched the progress of events, who have seen how little has been effected by the injudicious blockade of France, who have thought over the peculiar position in which the Brazils is placed in relation to Buenos Ayres, or who have the desire to see this country derive advantages from an intercourse with South America:—

" For the last time, my Lord, I shall now repeat my earnest conviction, that the combined intervention proposed in the affairs of La Plata is a measure one-sided and unjust, as against one State which has faithfully fulfilled all the obligations of treaty and alliance; that, as in partial preference of another State, if so a ruling faction may be dignified which is absolutely without a head, without indigenous root, foreign of origin, and existing only on sufferance of foreign mercenaries, it can only end in the perpetuation of domestic misrule and anarchy incompatible with the fulfilment of any obligations; that it is a measure moreover uncalled for by any British interest aggrieved or in jeopardy, inconsistent with British policy, and calculated to involve the British name and character in the same distrust and discredit throughout Spanish America which now attaches so peculiarly to France. It is a measure equivalent to more than a "war in disguise;" it is the consummation of wrongs perpetrated against Buenos Ayres by the infliction of a greater wrong still.

"The infelicitous illustration of the *entente cordiale* with France by the Premier, in this unhappy coalition of purpose, will fail to inspire greater faith either in its sincerity or duration. Confederacies for wrong hang together like ropes of sand at the best. Your Lordship knows, much better than I can pretend, what is passing and projecting in the East and South East. The Texan and Oregon questions in the West promise fairly to try and to strain the extent of the *entente cordiale*, of which we hear so much. M. Guizot, supposing his position permanent, must be, as he has been, the slave of the circumstances and exigences of particular crises.

"You are about, my Lord, to embark on hostile enterprize against the Argentine republic, excited mainly, I fear, by unfortunate prepossessions against the personal character of its chief authority—prepossessions grounded chiefly on the untiring misrepresentations and desperate malignity of the most depraved and discreditable of testimony. In the background are seen alone, darkly, a band of loan-mongers and schemers, eager to let slip the "dogs of war." France, with far other motives, is quite ready to join in the affray, although in 1841 only M. Guizot himself took great credit in the Chamber of Deputies for good fortune, if not for ability, in the treaty by which the weary contest with Buenos Ayres had been concluded. '*Il a mis fin*,' said he, '*a une expédition qui coûtait chaque année des sommes enormes. Enfin il nous a fait sortir d'une lutte dans laquelle nous nous étions imprudemment engagés, une guerre étrangère qui ne nous regardait pas complètement, une guerre civile qui ne nous regardait pas du tout.*'

"Never was the Argentine republic, therefore our commercial relations with it, in a state so prosperous and progressing as at present, and for some years past, under the rule of Rosas. The population is rapidly on the increase; so, also, the raw products for exportation, which we require; so, also, the internal consumption and increasing wants of finished wares, the supply of which is almost a British monoply. The official trade returns do not, and cannot, declare the whole amount of our exported values for the Argentine market; for it comports with my own knowledge, that ships are freighted, entered, and dispatched, as for Brazil, the real destination being Buenos Ayres; the reason being, of course, the interest and inclination of the merchants to conduct their operations with all possible concealment, so as to avoid or anticipate competition. Such, also, have been the results of public confidence in the government, and of the credit inspired by the honest administration of its resources, as well as by the advancing developments of agriculture and commerce, that the rate of exchange, which some few years since was depressed so low as one penny three farthings is now at fourpence; whilst the bonds representing the debt of the republic in this market, which were at forty, are now at eighty-two. Rosas, in the midst of all the costly embarrassments of wars with France and Monte Video, and with internal revolutions to boot, not only contracted no debts, but has found the means for partially redeeming the onerous obligations entailed on the State by improvident borrowing predecessors, who had not even the excuse of wars for running into debt.

"Here, my Lord, I conclude. I have undertaken a defence of the character of General Rosas, and of his system, in the face of popularly debauched opinion, without binding myself to any indiscriminate approval of either one or the other; holding myself free to deal with the incidents of both as they may come before me. I believe him to be scandalised, past any example, upon a paid and organized system of slander; and I resolved, therefore, that the good old English justice should not be denied him of "fair play." In the daily press of this city he could obtain no sufficient hearing. Knowing the press intimately, and independent of it as of him, I determined that he should be heard before the British public, daily papers or not. I am not unconscious, my Lord, that the tone of this pamphlet is rather that of a partisan; but, most atrociously abused on the other side the water by those who do not know me, and more virulently abused on this side by those who do, for what I have written before, I may be excused, perhaps, for a certain measure of excitement in language, which, I believe, has never carried me beyond the limits of fact and truth."

THE GAME OF CHESS BY THE ELECTRIC TELEGRAPH.

What the changes are that are to take place in our social condition by the three great agents lately brought by science into action,—steam, electricity, and the atmosphere,—no human intellect can foresee. The more immediate effects are just visible. Of the speed with which we can travel we can form at present no exact estimate; but we can prove that we can communicate our ideas by electricity from one spot on the earth round the whole globe in one-tenth of a second. The game of chess lately played at the two termini of the South-Western Railway is a popular illustration of what can be effected at present, though it by no means exhibits the marvellous powers which the electric telegraph may yet be brought to show. The only striking feature of this experiment was the regularity and precision with which information of the moves was uninterruptedly conveyed for a number of successive hours. The descriptions with which we have from time to time furnished our readers of the different electro-magnetic telegraphs, and more especially of that of Mr. Wheatstone, have enabled them to understand the mechanism which was brought into action. Owing to the anxiety to promote in the most liberal manner the objects of science which the Directors of the South-Western Railway have always shown, we were enabled to be present at the distant station, Gosport, during the performance of the game, and enjoyed ample opportunity of witnessing the simplicity of the mechanical means which Mr. Wheatstone has adopted, the advantageous use he has made of the velocity of the electric current, and the distinct and lucid means he has employed of displaying the necessary signals. Of the game played by those distinguished professors of Chess, Mr. Staunton and Mr. Walker, we have little to say; the battle may be considered to have been rather one of rapid execution than slow calculation, as the object was more to test the powers of the telegraph than the skill of the players. It was, as might therefore be expected, a drawn game. The amateur of this beautiful science, however, might have derived a more than usual share of information, for, during the period when the player was in expectation of a reply from London, Mr. Staunton went over the probable moves which were about to be made by his adversary, and threw out various suggestions which were in themselves admirable lessons. This fortunately relieved the tedium which would otherwise have arisen from the circumstance of being obliged to wait sometimes more than ten minutes before the determination of the London player was made known. This, together with the well known conversational powers and lively observations of Mr. Staunton, distinguished as he is for gentlemanly manners and first-rate ability, enabled us to remain from eleven o'clock until nearly six in the play-room, during which various messages, questions, and answers were unremittingly passed backwards and forwards, without in the slightest degree affecting the telegraphic communication which kept up the game of chess.

We may anticipate some most singular effects will be produced by the electric current. There is no reason why any great event might not be communicated at the same instant throughout the whole kingdom. The salutes fired on the occasion of her Majesty's visit to the House of Lords might be instantaneously repeated, at every station, on all the railways in England; for the electric flame fires gunpowder, and the explosion of the powder is at the same instant with the crack of the discharge. The expense of Captain Warner's long range is at once spared to the country; instead of blowing up a ship at the moderate distance of six miles by one of his projectiles, we shall be enabled to do so at the distance of a thousand miles. There is, indeed, no reason why one of the Lords of the Admiralty should not himself fire the guns of the batteries at Portsmouth, whilst calmly and quietly seated at the Board in Whitehall. Nor is there any reason why the electric current may not be made to answer in the more peaceful or even the more elegant accomplishments of life. A galvanic arrangement might be made by which our accomplished pianiste, Madame Dulcken, might, with all that taste and skill which delights her London auditory, perform at the same moment for the gratification and enjoyment of Gosport and Southampton, and wherever a few wires could be conveniently transmitted. We might also observe that the Society for the Prevention of Cruelty to Animals ought to call upon every butcher to kill the animals used for food by electric galvanism. Each of these persons should have a small galvanic battery for this purpose. Not only is all pain spared to the poor lamb, " whom thy riot dooms to bleed to-day," but the meat is rendered more tender, and more delicate. It is more than half a century since Franklin commenced those experiments which the remorseless hand of war put a stop to, which have been the precursors of the wonders of the present day. He proposed to give a feast to electricians, when " a turkey is to be killed for our dinner by the electric shock, roasted by the electric jack, before a fire kindled by the electrified bottle; when the healths of all the famous electriciansof England, Holland, France, and Germany, are to be drunk in electrified bumpers, under the discharge of guns from the electric battery." Were we to indulge in our prognostics of what will yet be done by the powers of electro-galvanism, we should be considered as visionary enthusiasts, and the laugh of the uninitiated would doubtless be loud and long; but already are some of the wonders made known, and nothing but the expense attendant upon them prevents them from being generally brought forward. By its means ships may yet be navigated on the ocean, our cities illuminated, the weather changed, life protracted, some diseases avoided; and we may use the language of him who first by electricity drew lightning from the clouds: "I shall never have done, if I tell you all my conjectures, thoughts, and imaginations, on the nature and operations of this electric fluid."

THE GOLDSMITHS, SILVERSMITHS, AND COPPERSMITHS OF ANCIENT EGYPT.

In all that concerns the founding of metals, it is very obvious that the Egyptians, in the earliest times, had arrived at a high pitch of skill. We conclude this from the representations of the implements employed in trade and even in war, in the tombs, as well as extant specimens of brass and copper. But it is a mistake to imagine that iron, in an early period of the Egyptian monarchy, was unknown or unused. A wooden hand-plough, shod with iron, attributable to the date of Thothmes the Second, has been found. But warlike instruments of iron, and apparently of great beauty, (as appears from Rosellini's illustration of an armourer's shop,) were used in the earliest times, as well as in the era of the eighteenth dynasty. In the above illustration the distinction of copper and brass weapons from those of iron is made quite clear; some being painted copper colour; some green, as if bronzed; some yellow, representing brass: dark grey is employed for iron; the blue may represent steel. An inlay of yellow, appearing sometimes in the blue, might suggest that the art of damasking steel was known in those early times. The most extraordinary evidence of the skill of the ancient Egyptians in metallurgy consists in their power of hardening copper implements so as to cut granite. It appears to be a *lost art*. Improbable suggestions have been made as to the means by which this result was effected. It has been suggested that the stone might have been softer at the time it was cut than now; or, again, that it may have been softened by bruising the crystals. But neither of these suggestions will account for the extraordinary result. Rosellini thinks that the sculptures on the obelisks may have been engraved (like a modern engraving) with a wheel and a drill, and then brought to the edge and deepened with emery, which the Egyptian workmen obtained from the neighbouring district of Syria. This has a show of probability; but still drills of copper, such as those in the British Museum, would not effect the purpose nor touch the stone. Indeed it would seem that we must make up our minds to the humbling conviction of being behind the ancient Egyptians in this particular, in consequence of two facts brought forward by Sir G. Wilkinson.

1st. He states, ("*Manners and Customs,*" *&c.*,) that he has in his possession a copper chisel taken from the quarries, where it was employed in quarrying the stone. Now this chisel, as left by the workmen who had employed it, had its edge unimpaired; and that it had been long and violently used is proved by the facts that the upper extremity of the handle laps over, having been flattened by repeated blows of the mallet. 2nd. The allegation of our inferiority to the ancient Egyptians in copper metallurgy is proved by an implement of copper, formerly in the possession of Mr. D. Burton, the architect, and now, we believe, in the British Museum, which has the elasticity of steel, and in the composition of which an amalgam of tin has evidently entered.

It may in continuation be briefly affirmed, that all the instruments of bronze and brass now extant, especially the previous, prove the exceeding skill of the artisans of ancient Egypt in the fusing and combination of metals. That they made and employed steel implements, we have no proof; but it is scarcely likely that the obvious process of tempering iron by repeated heatings and immersions in water should have escaped them. A concluding proof may be adduced that the ancient Egyptians had a mode of tempering copper which we have not, that the copper implements which have been transmitted to us generally, and those which are deposited in the New Egyptian Room of the British Museum, are not only elastic but do not oxydize when exposed to the changes of the atmosphere. The armoury shop exhibited by Rosellini contains warlike instruments, contemporaneously collected together, of copper, brass, bronze, iron, &c., in proof of the preceding allegation as to the proficiency in metallurgy of the ancient Egyptian artisans, and coats of mail, scaled and ringed, inlaid with gold and brass, in the style of the middle ages. One large case in the New Egyptian Room at the British Museum is filled with bronze vessels used for the various purposes of cookery. Among them are large boilers, kettles, and cauldrons, while some resemble stewpans, and others the common modern saucepan; all exhibit the highest proficiency in metal founding and the luxurious completeness of the culinary department in the residence of an Egyptian optimate.

A few words may be added to the preceding observations as to the proficiency of the goldsmiths of Ancient Egypt at the same remote period of social civilization. Allusions have been made with a view to prove that high proficiency inferentially to the example of Moses, trained in all "the wisdom of the Egyptians," who immediately after the Exode burns and reduces gold to powder and makes it potable. This has been usually considered as one of the "lost arts" of Ancient Egyptian chemistry. Boerhaave has left on record a questionable recipe for making it; but in doing so, he adds, that it is the most difficult of all the experiments in chemistry. Other eminent chemists have candidly recorded the attempt and failure. Nor were we aware till lately that the experiment was deemed possible. A French chemist, however, named Goguet, is alleged to have recently effected the operation, which he also declares to be the most difficult in chemistry, chiefly by the aid of natron. The workmanship of golden ornaments by the ancient artisan of Egyptian Thebes resembles in delicacy and beauty the modern Indian workmanship in gold, which has been handed down from father to son from time immemorial. The golden plate of various descriptions taken from the illustrations of the tombs of the 18th dynasty, is tasteful and elegant. The golden baskets found pourtrayed in the tomb of Ramesses the Third, are many of them of surprising beauty. But a considerable number of ornaments of gold (found among the monuments of Egypt) have been deposited in the British Museum, and are there open to public inspection. They generally consist of rings, necklaces, armlets, bracelets, earrings, brooches, and various trinkets of the female toilette, including gold and silver mirrors; some of them belonging to the era of Osirtesen and Amenoph the Second; in other words, to the times of Joseph and Moses. From the concurrent testimony of Diodorus Siculus and Pliny, it appears that the gold was obtained from the mines of Orabus, on the Upper Nile, which have been worked for gold since the Christian era, but have been latterly neglected. The gold dust, however, as appears from the monuments, came from Nigritia or Abyssinia, whence the present Pacha of Egypt is making an effort to reobtain it. The whole process of working gold is exhibited in the illustrations taken by Rosellini from the Tombs of Thebes and Eilythicæ. From them it would appear that the gold-dust was washed and strained previous to being weighed. It was circulated as coin, in the shape of rings of a certain weight, and stamped; although it does not seem that there was any gold currency in the modern sense of the word. In the goldsmiths' warehouses a scribe or clerk is generally represented in attendance, with his writing-desk and materials at hand, and sometimes with his reed pen behind his ear, recording the amount of gold obtained from the refining process, the weight, pureness, &c. Workmen are seen depositing the golden ingots in safes, and the gold-dust in sealed bags, while others are producing articles of gold workmanship from chests of drawers for the inspection of customers. The peculiar scales with a pendulum, always accompanying pictures of the judgment of the dead, are never absent. Specimens of the exquisite perfection to which the art of gilding was carried, as a branch of the goldsmiths' trade, may be seen on the splendid mummies of the new Egyptian Room of the British Museum. To judge from Rosellini's ample variety of illustrations, copied from the Tombs, the golden and jewelled banquet services of the Pharaohs must indeed have been magnificent in materials, form, and decoration. Some of the urns, candelabra, epergnes, hunting cups, and exquisitely-designed vases, supported by Caryatides, would not have disgraced the warehouse of Rundell and Bridges, or the show-rooms of Howell and James. They are equally curious and splendid, and in every respect worthy of adorning the banqueting tables of the magnificent line of princes who ruled at that " city of thrones," the hundred-gated Thebes.

Homer bears witness to the exquisite ingenuity and profusion of the gold workmanship of those remote times, when he refers to clock-work, or internal machinery, by which golden thrones and banquet tables moved towards him at the bidding of the guest. Its profusion and proficiency are expressively —with direct reference to the Egyptian Pharaohs—in the following lines recorded:—

> Alcandra, consort of Thones' high command,
> A *golden distaff* gave to Helen's hand,
> And that *rich vase* with golden sculpture fraught,
> And silver chased, which beauteous Philo brought.

It has been surmised that Corfu was an Egyptian colony, like Athens and Argos; and discoveries of Egyptian tombs and tablets by Lord Nugent, when officially residing there, tend to confirm the surmise. The garden and palace of Alcinous, (as described by Homer,) the latter especially, with its row of cynocephalic sphynges, columns, and candelabra, are in their plan purely Egyptian. From that gorgeous description, a fair conception may be formed of the luxurious profusion and proficiency of ancient workmanship in gold.

> The walls were massy *brass:* the cornice high
> *Blue metals* crown'd in colours of the sky,
> Rich *plate of gold* the folding doors incase,
> The pillars *silver* on a brazen base.
> *Silver* the lintels deep projecting o'er,
> And *gold* the ringlets that command the door.
> *Two rows of stately dogs* on either hand
> In sculptured *gold* and laboured *silver* stand.
> There Vulcan formed with art divine, to wait
> Immortal guardians at Alcinous' gate.

Alive each animated form appears,
And still to live beyond the power of years.
Fair thrones of gold from space to space were raised,
Where richest carpets with embroidery blaze;
Refulgent pedestals the walls surround,
Which *boys of gold* with flaming torches crowned;
The *polished ore* reflecting every ray
Blazed on the banquet with a double day.

ON ATMOSPHERIC RAILWAYS.

By Dr. J. G. Hewlett.

We directed the attention of our readers, some short time since, to the probable establishment of atmospheric railways upon many of the great lines of this kingdom: we likewise announced our intention of devoting some space to the consideration of Mr. Pilbrow's invention: this task we have been spared, by the kind permission of Dr. Hewlett to transfer to our columns his admirable paper on the subject, which, when read before the Society of Arts, deservedly obtained the warmest approbation. It explains, in so simple, easy, and intelligible a form, all the leading points, that no language of ours could render it more available to those who feel anxious to know what are the views entertained by the original proprietors of the patent, and those who are about to embark their capital in carrying out a scheme which promises to be of such public utility. The vast mass of persons who are now deeply interested in all that belongs to rapid locomotion may have an opportunity of judging for themselves how far the plan proposed is likely to be serviceable: for ourselves, we entertain but one opinion, which is, that it should be urged upon the consideration of all those whose business it is to carry out the gigantic schemes now in agitation.

"In no subject is an active, energetic, and commercial people more deeply interested than in the means for safe and expeditious intercommunication; and, as we have long maintained a high pre-eminence among the civilized nations of the earth for our zeal, enterprize, and commerce, we can only expect to secure these honourable distinctions by affording every possible encouragement to those inventions and discoveries which have a tendency to bring the arts and sciences to the highest degree of culture and practical utility. The truth of this statement has been admitted; and yet a strange but most decided opposition has been raised to almost every remarkable invention that has been introduced during the last fifty years. The proposed locomotive steam-carriage was most violently opposed by the devout lovers of stage-coach travelling. The olden times and the olden ways were so much admired, that any innovations on the olden practices were dreaded with a terror—a little less than that felt at an approaching earthquake. That the whole host of interested parties should be opposed to a new and improved mode of travelling was no more than might be expected, because the doctrine of vested rights, as maintained and practically carried out in this country, had ever been a mighty barrier to all social and moral improvements. But that parties, who had no such rights to be jeopardised or damaged, should be opposed, must be a matter of surprise to every reflecting mind; for not a few, both in Bristol and Birmingham, were to be found who, on hearing of the respective railways proposing to accomplish twenty miles an hour, said, with much complacency,—'Let others venture their necks who please; but as for me I am quite contented to travel at the rate of ten miles an hour, including all stoppages, and think it is speed enough for any reasonable man.' And so it was, according to the means employed—means which involved no small amount of suffering and cruelty to animals; but now that locomotive power has become a general mode for the transmission of men and chattels, the very persons who were so timid, and so dreading consequences, are now among its warmest advocates and substantial patrons. Yet this must not be regarded as an ultimatum, but merely a step in the ever-advancing course of improvement. Seeing how former inventions have been treated, on their first introduction to public notice, by the populace at large, it is no more than experience has taught us, to expect that every bold invention, developing some new power, should meet with a similar treatment: and, upon this principle, a host of prejudices are arrayed against atmospheric railways. The prejudices which have existed against former inventions, and subsequently given way to approbation and admiration of the highest order, induce the writer of this paper to think, that those prejudices arose from a want of information, and a consequent misapprehension of the whole invention. This is certainly the case in reference to many who are opposed to atmospheric railways; they talk of accidents occurring by this mode of travelling which must, of necessity, be more fatal than accidents by the locomotive power. No mode of travelling can pledge an entire exemption from accidents. A small piece of orange peel on our ordinary pavements may occasion the death of the man who accidently puts his foot upon it. But this is very different from a company of men looking pale with fear, dreading that a shower of pumpkins from the moon will dash them to pieces, when they have not as yet any credible testimony that there are pumpkin gardens in the moon. With the utmost respect for the fears of the timid, and the misconceptions of the uninformed, we venture to think, that a few plain matter-of-fact statements will have a tendency to dissipate their fears, and correct their misconceptions. Correct definition is the foundation of all sound information. The terms constantly employed on this topic are 'locomotive power' and 'atmospheric principle or power.' Locomotive power is the mechanical force identifying itself with the carriages moved. Atmospheric power is a mechanical force acting on the carriages through different media—a force renewable at intervals on the line—so that the atmospheric power is often classed with the stationary, as the impulse, or cause of motion, is only at intervals, as in some railways, such as Blackwall, the rope by which the carriages are moved is put in motion by a power that is entirely fixed and distinct from the carriages themselves. The history of atmospheric railways will satisfactorily show that the principle is not so new—and, consequently, the plans constructed on it by no means so *jejune* and immature—as some imagine. If seven cities have contended for the honour of being the birthplace of Homer, it is no wonder that many persons who have had thinkings and imaginings on the subject should contend for the honour of being the inventor of the atmospheric mode of propulsion. There are some difficulties in tracing this Nile to its right source; the first authentic data, however, which we have immediately connected with the subject, is the publication of a pamphlet in 1810, by Mr. Medhurst, in London, in which he proposed the idea of employing the power of the atmosphere created in an extended tube laid between the rails, and communicating the moving power thus obtained to propel carriages travelling along a road. Mr. Pinkus, however, asserts, that Mr. Medhurst only proposed the impracticable part of Papin's plan of forcing air under the compression of many atmospheres, as several others before him had done, adding, at a subsequent date, the idea of moving a piston through an under ground tunnel, by forcing in air behind it, from distances of twenty miles apart, and, by means of such piston and tunnel, impelling passengers and goods. Medhurst's first plan was to convey letters and goods by means of rarefaction and compression of air in a channel six feet high and five feet wide, contained in a paved road or iron railway. Mr. Medhurst, it should be observed, took out no patent, performed no experiments, and distributed his pamphlets chiefly amongst his friends; so great controversy has always existed as to the legitimacy and extent of his claims. In 1824 he contested his claims to invention, in a paper war with Mr. Valance; and in 1840 Mr. Pinkus contested them. In 1817 Mr. Lewis proposed a plan, which was a modification of that of Medhurst's. In 1824 Mr. Valance took out a patent for this method of an underground tunnel, also availing himself of rarefaction and atmospheric pressure. Mr. Valance made experiments with his system at Brighton, but does not appear to have been successful, so that his patent produced him no return, while Mr. Medhurst claimed priority of the invention. There is, however, strong reason for deciding that Mr. Valance first proposed employing the power of the atmosphere against a *vacuum* for railway purposes, as Mr. Medhurst did a *plenum*.

In 1828 Mr. Medhurst re-published his pamphlet of 1810, and he then proposed to use a tube comparatively much smaller, to enclose a piston in it, and to transmit its action to the outside through a longitudinal opening; he proposed also to have stationary engines twenty miles apart, for forcing in air. Of this plan he published a drawing, showing a long box, and a pipe suspended over a channel of water, in order to make a water joint or valve. According to the assertions of some of his friends, he made experiments with this and failed, from the impossibility, explicitly says one, of making the continuous communication from the inside of the pipe to the carriage tight enough to allow a useful degree of rarefaction to be produced; Mr. Pinkus, however, says that he was well informed that Mr. Medhurst never made a single experiment. The suggestion of that mode of railway transit appears to be fairly due to Mr. Medhurst; the important step of creating a vacuum before the piston belongs to Mr. Valance, while the further improvement of attaching the piston to an external carriage is disputed by Mr. Medhurst and Mr. Pinkus; Mr. Medhurst's pamphlet is certainly the *first* publication, while Mr. Pinkus quotes no evidence as to his own claims. On the 1st of March, 1834, Mr. Pinkus brought out his first patent; and in this he proposed as a valve, one in the form of a cord or rope, and which he calls a valvular cord. Mr. Pinkus states that in 1830 he had again prepared fresh plans and specifications, such as are now enrolled, and that he had exhibited them to his friends, and in 1833 commenced his patent. In 1834 he constructed a large working model, which was publicly exhibited in Wigmore Street; according to the Samuda advocates, the experiments were a complete failure; but in 1836 an association was formed for working under Mr. Pinkus's principle, and contracts were made for works, to demonstrate the principle. In 1836 Mr. Pinkus took out another patent for this country, with improvements, and also for foreign countries; in this the valve was formed of iron plates, secured to felt, to lay against pieces of wood, which he proposes to fix to the inner sides of the trough, as presenting a smoother surface than cast-iron; he also described a spring copper valve, fastened at its foot to the pipe, and meeting at the top in the shape of an inverted V. The system was then called the pneumatic system, and excited a good deal of attention, and much controversy. At this period works were designed to be applied on the West London Railway, at Wormwood Scrubbs; the works nearly completed a line half a mile in length, formed on the margin of the Kensington Canal, which was united with that line of railway; Messrs. Samuda and Hague were the contractors for the engines, the former also for the mains and valves. Mr. Clegg is claimed by Mr. Pinkus as having been at that time confidentially employed and consulted by him, and as having witnessed the progress of the experiments; to these assertions of Mr. Pinkus we have not seen a satisfactory answer; certain it is, that on the 3rd of January, 1839, a patent was taken out by Messrs. Clegg and Samuda, from which practical results have been obtained. The grand principle of the improved atmospheric plan, up to this period, was hermetically sealing the valve with a composition each time the train passed. In 1838, experiments had been made on this plan at Chaillot, through the exertions of Mr. James Bonfit. Next, an extensive experiment was performed on Wormwood Scrubbs, on the West London Railway, Mr. Pinkus's apparatus having been removed, his company falling to the ground for want of funds. The portion of the line selected was half a mile long, with a rise of 1 in 120 for rather more than half the distance, and 1 in 115 for the remainder. On the 11th of June, 1840, this line was opened for experiments, and these were attended with sufficient success, and so far sanctioned by the approval of eminent engineers, as to justify further proceedings. We should observe, that on the 3rd August, 1839, Mr. Pinkus obtained a third patent, in which he describes a valve and composition precisely similar to Clegg and Samuda's; on the 24th March, 1841, a fourth, where he proposes a gaso-pneumatic power. About 1841, Mr. Bonfit set up at Havre, in the factory of M. Nilbus, machinery for manufacturing Clegg and Samuda's valve. At the close of 1843, Clegg and Samuda's plan was laid down on the Dalkey line for the short distance of one mile and a quarter; this is a continuation of the Dublin and Kingstown line. And in the subsequent history of atmospheric railways, we have last—but, as we imagine, not least—the extraordinary but simple invention of Mr. James Pilbrow, which obtained a patent on the 18th November, 1844; this invention does away with the continuous valve altogether, having many other advantages which preceding inventions cannot claim.

"As the two plans which now chiefly engage the attention of the public are that of Messrs. Clegg and Samuda, and that of Mr. Pilbrow, we purpose, in a subsequent part of this paper, to give a minute description of each of these plans, and a comparative estimate of both. At present we invite your attention to the general advantages of the atmospheric system above steam locomotive power. A diminution of expenditure is one of the most obvious advantages. In the original outlay there is not a necessity for that extensive levelling as is now required; engines of very great power will not be needed; the wear and tear of materials will be diminished; and, by consequence, the rates of charges for travelling will be lessened, and cheap travelling will be secured with a certainty of increased safety and comfort. This advantage of safety is one of paramount importance. The atmospheric system precludes all the terrible calamities of bursting boilers and burning trains, with which the public has become painfully familiar. Running off the line is also avoided, since, in the atmospheric system, the impelling power is at the centre of gravity, and must, from its action, keep the train on the rails. A collision of trains, from which such disastrous results have arisen, cannot possibly take place on the atmospheric principle. Then, not to enter into any metaphysical discussion of the question, how much the very consciousness of safety promotes our comfort—it may suffice to say, that the atmospheric system offers a full enjoyment of the pure atmosphere of heaven as you quietly glide on by an invisible power, and entire freedom from the clanking of cumbrous machinery, flying sparks, hot cinders, and strong sulphuretted hydrogen. Another advantage is, increased speed—the average rate of travelling by the atmospheric power being fifty miles an hour, while the highest velocity of travelling on the fastest line, by steam, is thirty miles an hour; and, in a country where time is appreciated as property of great value, this must be considered of paramount importance did it exist alone; but when speed can be secured at less expense, and with increased safety and comfort, no doubt can exist to which system the most decided preference is to be given. The plans of atmospheric railways, now fairly before the public, claim our particular attention. The first we notice is that of Clegg and Samuda; and we cannot do better than give the description drawn up by M. Arago. We shall now say a few words on the manner in which they have contrived to establish an immediate and unyielding connexion between the piston, on which the atmosphere acts as a moving power, and the leading carriage of a train running outside the tube on the ordinary rails. This inflexible connexion, of which we have just spoken, could not be established conveniently, except by means of a metal rod passing from the piston to the carriage. Now, as it is necessary that this connexion should be maintained during the entire course of the piston, there must be a longitudinal opening in the upper surface of the tube. It is along this upper slit that the metal arm travels, by means of which the movement of the piston is communicated to the leading carriage of the train, and thence to all the others. This rod, or arm, has been very justly called the connecting or moving arm, or plate. But, it may be asked, if there is an opening in the tube, how is the vacuum to be produced? We give the reply. The opening is continued the whole length of a valve, by which it is hermetically closed; the vacuum can be thus successively produced in that part of the tube to the left and right of the piston, as in the closed tube, of which we have spoken in the commencement. By a movement, to which we shall presently refer, the valve is partially opened near the piston, so as to let the connecting plate pass; after which it immediately falls by its own weight. This is the most delicate part of the apparatus. If the valve actually closes the opening, a perfect vacuum is produced and maintained, by which we obtain a permanent and powerful moving force. On the contrary, should the valve allow the air to enter by any fissure, we cannot produce a sufficient vacuum but by having recourse to a very powerful air-pump—and, moreover, this imperfect vacuum can only be supported by the continual action of the pump. The longitudinal valve, which closes the opening of the tube, is formed of a strip of leather of indefinite length, strengthened above and below by a series of iron plates of about a foot long, and not leaving a space between them of more than three-eighths of an inch. Weight is thus given to the valve without destroying its elasticity. The leather is closely and hermetically fastened by one of its edges to one side of the opening. The other edge remains unattached and moveable; and, when the valve is closed, it merely rests on the second lip of the opening, which has been previously covered in its entire length by a composition of wax or tallow. When the valve opens, that edge of the leather fastened to the tube bends, and thus acts as a true hinge. The valve is never raised to a perpendicular position; its movement never exceeds an angle of forty-five degrees. The mere falling of the valve by its own weight does not give it sufficient adherence to the edge of the opening, so as to prevent the entrance of air into the tube; therefore it scarcely resumes its place before it is heavily pressed by a wheel fixed at the back of the leading carriage, to which also is attached a cylinder filled with burning charcoal, for the purpose of melting the composition of tallow and wax by which the valve is held down. This is a full description of the Clegg and Samuda atmospheric railway. Did time allow, we might also notice a similar plan by M. Hallette, of Arras. We come now to notice the invention by Mr. Pilbrow, C.E., for which a patent has been taken out. Now this invention does not appear to be, like many of its predecessors, a mere improvement in some mechanical detail, but seems rather to be a new creation—a new system altogether. It might be asked, where Clegg and Samuda's patent differs from Pinkus's, &c., or what have Clegg and Samuda done? but no one will find it necessary to investigate far to discover the difference here—no one will ask that question as to Pilbrow's. By this plan, the necessity for the continuous valve running along the upper part of the tube is entirely avoided; the connexion between the propulsive principle within and the carriages without being obtained in a manner entirely distinct. The propulsion tube, instead of being broken, or stopped at intervals of a few miles, extends unbroken for the whole distance. At intervals, on the top of the propulsion tube—say every thirty feet—there are placed boxes and supports. Within these boxes are cogged wheels or smooth-surfaced wheels, (a combination of the two, as the model is now before you,) working horizontally on an axle or shaft, the upper portion of which passes through an aperture in the top of the box, and at the outside, or above these boxes, the same axles are made to bear rollers or wheels similar to those inside the box. The passages through which the shafts pass are rendered air-tight by the shoulders or flat fillet turned upon the shafts. [The lecturer referred to diagrams.] Attached to the propulsion piston is a long rod or bar, nearly fitting the small square channel or tube, cast upon the propulsion tube; and, running along with the piston, is conducted by this smaller tube between the lower wheels. Either side of this bar is covered with cogs, or is smooth, or a combination of the two, as the case may be, [the lecturer referred to diagrams and model,] corresponding with the surface of the wheels within the boxes above described. It should be mentioned, also, that these wheels, or rollers, are made to project in a slight degree within the smaller tube. [The lecturer pointed out the distinction between the adhesion and cog plan; the latter not being indispensable, but, on the contrary, arrangements which many prefer.] As to the model in particular, which meets all the objections raised against other forms or arrangements of this invention, the manner of working the apparatus is simply this:—the air being exhausted from the propulsion tube, the piston, with its rod attached, is moved along inside it by the pressure of the external atmosphere; and, as it moves, the rod works on the wheels on the inside, turns them round, and, as they turn the wheels outside, the boxes turn also. These external wheels are then made to act upon the train, by means of a rod attached to it, similar to that attached to the piston within; and thus, as the piston moves along inside the tube, the first carriage of the train moves along also over it outside the tube, through the medium of this double set of wheels and rods. In attempting to give a comparative estimate of these two plans, it is right to state that Clegg and Samuda's plan has most of the general advantages which atmospheric railways have over the present locomotive principle. The great distinction, however, between the system of Messrs. Samuda and that of Mr. Pilbrow is this—that in the former the connexion between the carriage train and the propulsion piston is direct; in the latter it is indirect, a third medium being employed. Another important distinction is that the Samuda system has the propulsion tube above ground, and has insuperable difficulties in crossing roads, and in intersecting other lines; the Pilbrow invention placing the tube below the surface, gets rid of all the objections in regard to crossing and diverging lines from the main trunk. The continuous valve of the Samuda plan, must necessarily occasion much leakage, while the Pilbrow plan, dispensing with the valve altogether, no leakage from that cause can possibly arise. The leakage of Samuda's plan is equal to 5-horse power per mile, but Pilbrow's only

2¼ horse power during the whole time of working every ten miles; the Samuda plan requires an exhausting engine at short intervals of about two miles and a half; the Pilbrow plan can be worked with only one engine at the interval of ten miles. The Samuda plan is remarkably complex, and, therefore, may be subject to frequent interruptions for repairs. As M. Arago inquires—'Can we hope for future success from a system, into which enters, as principal agents, a strip of leather of immense length, a composition of wax and tallow, and a hot iron to dissolve the wax?' Now, the Pilbrow plan is remarkable for its simplicity, and the fewness of agents employed. It is much to be lamented that the Pilbrow plan has been attacked, and difficulties ascribed to it, for which no grounds whatever exist—difficulties which have no existence whatever but in the imagination of the objector. Even the imagined difficulties must be frankly met, such as 'the fine ground metallic surfaces of the wheels soon being injured;' 'the friction and wear of the spindles by dust;' but the most formidable objection was stated against the use of cogs—that great speed would certainly break or strip the cogs. Now, the inventor has stated in his pamphlet, and in this room (January 8), that you may dispense with the cogs, and make use of adhesion, or a combination of the two, at high velocities, though it is right here to state, that an experiment has been made with the cogs at the rate of fifty-five miles per hour, and they did not break or strip. It, however, would be perfectly useless to spend time in refuting objections which have been either anticipated or already proved groundless."

One very important point which we deem it right to notice, is, that it is immaterial whether cog-wheels, threaded-grooved-wheels, or plain surface-wheels, be employed. The principle of *the invention* is the entirely new method by which the impelling power is *connected* with the carriages. And this is the chief feature in the invention, together with the great principle which distinguishes it from every former invention, viz., the entire absence of any continuous valve.

LORD ROSSE'S TELESCOPE.

In the "Times" of the 16th April there is a letter from Sir James South descriptive of this magnificent instrument, and of some of the observations made by it: there is one upon the occultation of a star by the dark part of the moon, which produced a phenomenon that, Sir James says, is involved in impenetrable mystery. The following is the account he gives, and the solution which is now offered will, perhaps, render the matter apparent

"On the 15th of March, when the moon was seven days and a half old, I never saw her unilluminated disk so beautifully, nor her mountains so temptingly measureable. On my first looking into the telescope, a star of about the seventh magnitude was some minutes of a degree distant from the moon's dark limb. Seeing that its occultation by the moon was inevitable, as it was the first occultation which had been observed with that telescope, I was anxious it should be observed by its noble maker, and very much do I regret that, through kindness towards me, he would not accede to my wish; for the star, instead of disappearing the moment the moon's edge came in contact with it, apparently glided on the moon's dark face as if it had been seen through a transparent moon, or as if the star were between me and the moon. It remained on the moon's disk nearly two seconds of time, and then instantly disappeared at 10h. 9m. 59.72s. sidereal time.

"I have seen this apparent projection of a star on the moon's face several times, but, from the great brilliancy of the star, this was the most beautiful I ever saw.

"The cause of this phenomenon is involved in impenetrable mystery."

Previous to the occultation, there existed a ray of light from the star to the eye of the observer. Now, whether the light is transmitted particle by particle, or whether light is transmitted by undulation, which the result of observations and the balance of probability renders the more certain, the following effect would be the same.

The ray of light represents the star in all its parts the moment the star is obscured by the passage of the moon, the star itself being fixed, the ray would not disappear until the time had elapsed which it takes to pass from the moon to the earth, a distance of 240,000 miles, this taking up two seconds of time or thereabout, the spectrum of the star would remain on the eye during that space, and then would instantly be lost. The moon itself continuing to advance would give the spectrum the appearance of passing a short distance upon its face, and, as Sir James says, leading us to suppose the star was seen through the moon.

Sir James South afterwards, in relation to the passage of the satellites of Jupiter over his face, asks the following question:

"Will the telescope tell us why the satellites of Jupiter, which generally pass over Jupiter's face as disks nearly of white light, sometimes traverse it as black patches?"

In endeavouring to solve the preceding question, we shall have to state a few facts about which there is no dispute. The diameter of Jupiter is well known to be 94,100, while that of the earth is 7970. The largest of the satellites of Jupiter in its diameter is not equal to that of the earth. These respective diameters will give proportionate areas on the spheres of surfaces capable of reflecting solar light. The magnitude of these surfaces will give very different appearances of light according to the mass which they present, and, consequently, the reflected light of Jupiter from its immense area, which is so much larger than the earth, although at a distance of more than five times that of the earth from the sun, will receive and reflect a far greater amount of light than the earth, or its own satellites, which will account for the intensity of the luminous appearance of Jupiter. We judge of the intensities of light by comparison; for instance, a board painted white will appear far darker than writing paper, and writing paper darker than snow newly deposited. The intensity of light, therefore, upon a satellite will be greatly less than that of Jupiter: but we must go a little farther; light is reflected most intensely precisely at the angle of incidence. Now the reflective spaces on a sphere of small dimensions are very greatly less from this circumstance than the space upon one of far greater area. If, for instance, any one will hang up a whited ball and cast a ray of light upon it, he will find, excepting in the angle of incidence, which depends upon the situation of the eye of the observer, that the rest of the parts of the ball, as they recede from that angle, will become darker. Now, these being the premises, we ought not to be surprised at a satellite possessing so very small a comparative share of light, in respect to its primary appearing dark on passing over the most luminous part of Jupiter, although it may appear light when viewed separately from him, or even whilst passing over any of the less illuminated parts of the planet itself.

The small quantity of light that these satellites reflect, and not its intensity on the angle of incidence, is the reason that these satellites are not seen by the naked eye upon the earth.

We trust that the foregoing explanation is sufficiently evident, at the same time that we respectfully submit that if astronomers would make themselves masters of a little natural philosophy, in addition to their great attainments as mathematicians, they would be able to solve not only many of the appearances of which we are now cognisant, and on which there seems to be an extraordinary degree of ignorance, but also to account for those new and important facts, which we fully depend upon being made known, by the further use and contemplated improvement, according to Lemaire's plan, in Lord Rosse's telescope, for the spirited and able construction of which his Lordship has laid the scientific world under enduring obligations. J. A. BORRON.

IMPROVEMENT OF ENTAILED ESTATES.

An important subject, intimately affecting the progress of agriculture, and the interests of all dependent upon it for their incomes, whether landowner, tenant, or labourer, has been brought under the notice of Parliament by the Duke of Richmond, in the course of the past month, and a committee appointed to inquire into it. We allude to the law in reference to entailed estates, especially as relates to improvements made upon them. It may not be generally known that no less than two-thirds of the estates in England and Wales are under entail or settlement; the condition of that state of things being that the tenant for life is deterred from laying out money upon draining, and other permanent improvements, because if he did so, he would have to do it out of his own pocket and at his own risk, there being no power whereby he can charge even a part of such outlay as an incumbrance upon the land. The consequence is, that thousands of acres of land remain undrained, thousands of labourers unemployed, and hundreds of thousands of capital diverted into other courses.

In Scotland, on the other hand, which has always been considered the stronghold of the principle of entail, a more wise and liberal system prevails. There, by virtue of various Acts of Parliament, particularly the Montgomery Act, (1770,) and the Aberdeen Act, (1824,) these disabilities of the tenant for life have, under certain restrictions, been removed, and to the evident advantage of both tenant for life and his successors, in the improved character and rental of the land.

The contrast between the effects of the two systems we find strikingly instanced in the case of Mr. J. Adam Gordon, who, himself a large landed proprietor, has for some years been most active in drawing the attention of his brother landowners—particularly those suffering under the thraldom of entails—to the subject. Mr. Gordon's speech, as chairman of the Tring Agricultural Association, October, 1844, and his address to the Council of the Yorkshire Agricultural Society, March 13, 1845, and which are now before us in the form of a pamphlet, contain all the facts of the case in a lucid and synoptical form. In the latter address, Mr. Gordon candidly confesses that he is moved to take up the matter by self-interested motives, and if he can show others why they should do so likewise, what stronger grounds could he urge? Mr. Gordon states, that he is tenant for life of strictly entailed estates in the counties of Somerset and Hertford, in the islands of Antigua and St. Vincent, and also in Scotland; and what is the result of his experience?

"I am also a tenant for life of entailed estates in Aberdeenshire in Scotland, entailed in perpetual entail by a more remote ancestor, and probably with just as many fetters and restrictions, only that the venom of them has been diluted, and the grasping caprices of meddlers with centuries to come, curbed by the wise Acts that have been obtained by the Scotch, and have been passed from time to time, called the Montgomery, the Aberdeen, and Roseberry Acts, unfortunately extending to that kingdom only. I have found great difficulty, or rather no power at all, in improving, leasing, exchanging, or draining, or building upon my entailed estates in England, from inability to raise money or charge the next heir with a fair proportion of the expense, and having no power of leasing or exchange; so that the consequence is, that while in the period of seventy years my estate in Scotland has quintupled in rent, in this country my estates have not doubled, although the land is more fertile, the markets nearer, and the seasons more genial."

We have no doubt that if other English landowners were asked, they would tell the same tale. In his speech at Tring, Mr. Gordon speaks more in detail, and extends by a parity of reasoning the same liberal principle to the case of the tenant farmer.

"Unless," he says, "farmers had leases, it could not be expected, nay, it would not be safe for them to carry on experiments. He had visited East Lothian, which he had just heard Liebig, at the Glasgow dinner, pronounce the first agricultural district in the world. Well, there the farms were let on nineteen years' leases. (Hear, hear.) On those farms were steam engines, and every sort of machinery and implement. There the tenant farmers originated the proposition to give £600 a year to Professor Johnston, to act as their agricultural chemist. He hoped it would not be taken amiss if he said that Scotland was fifty years in advance of England in agriculture. Why? Because the Scotch farmers had leases. (Hear, hear.) Two-thirds of the land in England was under strict entail or settlement. So it was in Scotland, but that was no barrier to improvement there. (Hear, hear.) The Duke of Richmond and himself, not to mention other proprietors, tenants for life, were engaged in improvements on a range of above fifty miles between the Murray Firth and the River Don, and were enabled to carry out these improvements in Scotland, because they could charge two-thirds of the expense on the next heir. That system encouraged tenants for life to lay out their money freely. (Hear, hear.) Scotland had enjoyed that Act, called the Montgomery Act, since 1769, and entailed estates were equally well cultivated, arranged by exchange, and leased with those in fee. (Hear, hear.) The English landlords of entailed estates and their farmers were fettered, but the Scotch not. Hence the latter were able to do great things. He had heard, 'Really you Scotch do things we English cannot.' But why not? Give Englishmen the same advantages as the Scotch, the same powers of leasing, and exchanging, and charging, and then every farmer in England would be able to do as much or more than the East Lothian farmers. (Hear, hear.) When landlords talked of tenants putting their shoulders to the wheel, it was natural for them to reply, 'At least, do you M.P. landlords put a little legislative grease to the axle, to make it work freely.' (Hear, hear, and laughter.) He considered the cause of agriculture was not best protected by the circulation, or rather the accumulation of pamphlets, 'one half of which was not believed; the other never read;' and that the money so laid out would be more beneficially employed in such prizes as were given that day, and useful experiments. Let their representatives in parliament make good their cause against all comers, by getting sound and simple laws for drainage, leasing, exchanging, building farm-houses, steddings, dykes, walls, planting, roads, enclosing, and schools, as Scotland had enjoyed for above seventy years; by which all the venom of entails had been extracted, and improvements encouraged in that happy country; while here, landlord and farmer were, as it were, bound in the legal fetters of the unmitigated mortmain of entail and settlement. Then it would be seen whether the English farmers were a whit behind their brethren of the north."

In a letter to Col. Arden, in Yorkshire, the same gentleman says,—"The rent of my Scotch estate, in seventy years, is quadrupled by the nineteen years' leases, the face of the country quite changed, every sort of improvement made, and I am commencing an outlay of 7,000*l.* or 8,000*l.*"

After reading these statements, we can only express our wonder that the beneficial effects of the Scotch law should have been seen and acknowledged by the world for more than half a century, and no attempt—at least no practicable attempt—made to apply the advantages of the same system to the struggling agriculture of this country. We say no practicable attempt, because it is certainly true that, in 1840, Mr. Pusey originated and carried into law a drainage Act, which proposed, as far as draining is concerned, to extend the Scotch principle to England. But the machinery by which he proposed that the parties should proceed was so intricate and cumbersome, that it very shortly became evident that the remedy would be more ruinous than the disease. When we state that all the necessary proceedings were ordained by this Act to be taken through the medium of the Masters in Chancery, our readers will at once readily agree with us in the last remark;

and we believe it to be an undoubted fact, as stated by Mr. Gordon, that "in four years, one person (but only one) did actually take advantage of it." Another presented the Act to his solicitor with a view of applying its provisions to his estates, who only asked his client, "How many dozen Chancery suits he was prepared for?" Disappointed with this result, Mr. Pusey actually, in 1844, brought in a Bill to repeal his own Act; but even this he was not able to do, the Bill being "shelved" before the session closed.

In this unsatisfactory position of affairs, Mr. Gordon, being himself an "interested party," and being invited thereto by Mr. Pusey, Mr. Smith of Deanston, and others, took the matter in hand, and framed the draft of a bill on the whole subject, based upon the principle of the Scotch Acts. This bill has been printed for circulation amongst parties who take interest in the subject: it has met with the avowed approval of the Yorkshire, West of England, and South Wales Drainage Associations, the Earl of Devon, Earl Ducie, Mr. Smith of Deanston, and several other high authorities; and will doubtless be taken into consideration by the Duke of Richmond's committee. We should state that Mr. Gordon's sketch of a bill proposes "to enable tenants for life to make certain provision" for their widows and families, which is also the law in Scotland; but, approving entirely of this proposal, we shall at present only attend to that part of the scheme which relates to outlays for improvements.

The provisions proposed by Mr. Gordon are very simple,—as nearly as possible similar to those of the Scotch law. In Scotland there is no interference of Masters in Chancery: all the form required is notice to the next tenant of entail, to lodge the vouchers in the sheriff's office, and to commence the improvements within a year. The powers thus placed at the disposal of the tenant for life are chiefly these:—to give nineteen years' leases; to charge the estate for three-fourths of all monies laid out in farm buildings, fences, dykes, and drains; and two-thirds for mansion houses, stables, &c., &c.; provided only that the charge should not exceed a certain number of years' free rental. By the excambion clause, also, power is given to exchange fifty acres of cultivated, and five hundred of waste lands, with neighbours, in order to straighten marches.

In the scheme proposed for England and Wales, the tithe commissioners are to undertake the duties performed in Scotland by the sheriff's office. The method of applying by the tenant for life is to give notice to the commissioners, and advertise three times in a county newspaper. Surveyors may be employed to report to the commissioners, who will guard the interests of the next heirs. The improvements contemplated are divided into two Schedules, according to their greater or less permanent utility; and three-fourths of the sum, but not to exceed four years' clear rental, may be charged on the estate for improvements in Schedule A; and two-thirds, but not to exceed two years' free rental for improvements, in Schedule B. It also gives power of leasing for twenty-one years, at a full yearly rental; but the mansion house, and home farm, &c., not beyond the life of tenant for life; power for leasing lands for building for ninety-nine years, but not within three hundred yards of mansion house; to exchange lands for equal value, not to exceed one hundred acres lying in one spot, or one-fourth of the property.

We will only say, in conclusion, that this measure takes up a very important subject, and that it appears to treat it in a lucid and comprehensive manner. It well deserves attention of all who are interested in the permanent value of landed property; and we feel satisfaction in having been amongst the first of public writers to direct their notice to it. We may add that many of its provisions are very similar in principle to the recommendation of the Irish Land Commissioners; and we trust that the day is not far distant when this beneficial principle will be applied equally to the three kingdoms of the empire.

ON THE AGRICULTURAL CHEMISTRY OF THE PRESENT DAY.

THE science of agricultural chemistry may be considered as indebted for its existence, in this country, to Sir Humphrey Davy; in his popular work, the best methods for analyzing the soils were first published, and the soundest applications of chemical knowledge directed to the purposes of preserving and rendering available the various manures. He first pointed out what changes in the soil might be expected from the nature of the crops, and the necessity of an accurate study of the manures to replace that which had been abstracted; but still in this, the work of one of our first chemists, we do not find any allusion made to those improvements which modern farming has introduced—bone-dust and draining. Years passed, and no further attention was paid in our works of chemistry to this subject than a recapitulation of the views of Sir Humphrey Davy, and a notice, apparently more to make a claim for what chemistry might do, than for what it had done, when Professor Liebig suddenly brought the subject again prominently forward. His work abounds in information, it is written ably, and so free from technical language that all students can understand it; and with them, the startling assertions in which it abounds have passed as undoubted facts.

Still, faulty and defective as this work is, it is to it we are indebted for the interest with which this subject is now regarded; and as chemists of great eminence have been appointed professors to the different agricultural societies, and their attention concentrated upon this point, and they themselves brought in direct contact with practical farmers, we may hope that chemistry will yet succeed in effecting those great improvements in this, which it has always done, sooner or later, for every science to which its aid has been called.

Beyond the excitement of this praiseworthy interest, the work of Liebig has done but little; to one view only was it directed; one object alone appeared to the writer worthy of attention, and that was the presence of ammonia. Was any manure beneficial, it was submitted to analysis; it contained traces of ammonia, its action was evident, and however satisfactorily its success could be on other grounds accounted for, they were never brought forward even as auxiliaries. So prevailing is this partiality for ammonia throughout the work of the Professor, that after a long drought, the luxuriant vegetation which succeeds the first refreshing shower is accounted for as due, not to the fact that the moisture has restored life to the parched-up vegetation, but to the minute quantity of ammonia which can be by chemical analysis detected in the rain; and the successive showers are not so beneficial, not from the plant being now supplied with the moisture for which it was perishing, but from their not containing the ammonia which the first shower had absorbed. The views, also, of respiration, as producing animal heat, which Professor Liebig has brought forward, regarding which the student, from the perusal of his work, would imagine there was no doubt, are by no means so clear as is there laid down; the strong points, it is true, are ably and prominently stated; new but unimportant facts are urged as evidence; but the theory rests precisely upon the same foundation as it did in the time of Priestley. The fact of the disappearance of oxygen from the air expired, the formation of carbonic acid as shown by lime-water, the removal of carbon from the dark venous blood, and its change to the bright red colour of the arterial, were then known, and the analogy thus presented to the changes of burning charcoal, then urged as a proof that as heat was produced by the one—the heat of combustion—it could equally account for that of animal life. But the adverse points which then prevented the adoption of this theory are passed over; it could be urged with the same force now, that caloric is not observed more in the lungs than in other parts of the body, which it would be, if they are to be regarded as the focus of heat; that no particular latent heat could be there detected by the closest tests; that in the experiments of Sir Benjamin Brodie, after decapitation, where artificial respiration was kept up, the temperature of the body sank immediately, though carbonic acid was freely formed; and various cases of injury to the nervous system have been recorded, particularly one by Mr. Guthrie, where this power of generating heat has been lost, where the individual, though wrapped in the warmest clothing, has not been able to keep up the standard of heat, though producing the full quantity of carbonic acid. The work of Professor Liebig goes, also, entirely to prove that ammonia is the natural stimulus to vegetation; under its powerful influence the plants absorb the carbon of the air vitiated by our breath, and thus grow; the waste of ammonia by the ill management of our manures was ably pointed out, and gypsum was recommended to be strewn about the stables to absorb it. But here, as an article in the "Agricultural Journal" pointed out, after experiments demonstrated, that gypsum will not, in stables, absorb the smallest portion of ammonia; the first agriculturists tried it without success; and though in the laboratory you can, by mixing solutions of ammonia and sulphate of lime or gypsum, form a sulphate of ammonia, and thus render it permanent, yet, in stables, where the gas exists diluted, no quantity of ammonia could be detected by the most delicate tests; yet Professor Liebig stated its absorption, not as a matter of theory, but as an acknowledged fact, and recommended its adoption in the strongest terms.

The study of manure opens a wide field to the Agricultural Society, every farmer depends upon it, and yet wastes at least one-half; it is true, by bone-dust, by guano, he can at a great expense replace this waste, but as this could be at once easily obviated, it is worthy the attention of the Agricultural Society, and we are surprised to find, not only how little this important subject has been attended to, but what erroneous views have been entertained. Here results attested by the chemist and the practical farmer would be a most valuable guide; at present, unfortunately, guano and other manures are classed roughly together; to apply them, it would appear simply necessary, without a single precaution, to throw them upon the land, and the results of the experiments—successful perhaps by chance, for the failures are never noticed—are stated. A large wheat crop has been obtained in some land; the reader tries it. His land may be unfitted: the hard subsoil at a few inches depth, as in some parts of Oxford, may cause it to be washed away; he may apply it at an unseasonable time, and it may be wasted; and the farmer, when ruined, is held up by his neighbours as a victim to speculation. The advantage of a well directed society is here most obvious; a chemist might analyze the manure, the experience acquired in his situation, with the assistance of those practically acquainted with agriculture, would enable him to suggest the time and the soils most adapted for the experiments, and on these trials, successful or not, the farmer could depend; gradually as the circle of knowledge became enlarged by these important investigations, the Society might further develop itself, and then, without the charge of arrogance, put forth its pretensions to cope with the Royal Institution, the King's College, and other schools of instruction, as a school for instruction in this branch of science.

When land is first submitted to cultivation, the science of farming is extremely simple: the seed requires but to be sown, the crops in due time to be collected; those lands only are selected which are drained by their elevated situation; when this is exhausted the settler moves on, till the land from lying fallow becomes again suited to the plough. In Poland and many parts of Russia this constitutes farming; the river is the reservoir for his manure, which to him is even a nuisance. But England is very differently situated; with a population rapidly increasing, a thousand souls added daily to its numbers, the decreased mortality from the advance of medical knowledge and the more perfect drainage of towns, the existence, whether for good or evil, of laws acting as a barrier, save in cases of famine, against any introduction of corn, this country requires the perfect cultivation of every spot; while, as neither our climate or soil are like the vast plains of Poland adapted to the growth of corn, by labour and the judicious use of manure only can we render it so. The first great point, therefore, with agriculturists, should be to render their soil similar to the fertile fields of the Continent; to neutralize the damp so inseparable from our insular condition by a perfect system of drainage, and to husband their manure by the simple processes of throwing a few handfuls of salt among the muck heaps, and by protecting it by coverings of clay or earth from the washings of the rain; a great saving would thus be effected; by the use of sawdust saturated with dilute sulphuric acid freely sprinkled amidst the straw so used for litter, the valuable alcali ammonia, instead of being as now a nuisance, would be absorbed, and as urea has always been found one of the most powerful of our fertilizing agents, a very great advantage would result. Thus far at least the agriculturist could advance with the most perfect safety, and further experiments would soon improve the method of applying his manure. It is now strewed loosely in the field, the gases evolved during decomposition can escape freely, and the rain, upon which the farmer depends to soak his manure into the earth, must, if at all in excess, wash its valuable salts away; we have often examined the water in ditches near the fields where these manure heaps have been laid, and have invariably found them strongly impregnated with saline particles. Some experiments, too slight to deserve more than mention, would appear to show, that protecting it with a covering of earth, ploughing it as it were into the land, might be adopted with advantage; the experiments are not yet sufficiently complete to be published. On most lands the weeds are burnt—thus at least the farmer secures the destruction of the seed; but on the policy of this the practical agriculturists do not agree. We have heard, on viewing a well cultivated farm, the owner declare that it was due to his care in keeping it so clean; he regularly pares and burns it, while a few miles further it was urged against a tenant he had impoverished his land by this very practice. Undoubtedly a very large source of manure is here destroyed, for the ashes are useless; we have repeatedly examined land where they have been strewn without the slightest sign of improvement, but on pointing this fact out to the farmer, you are referred to the luxuriating growth on those spots where the heaps of weed, &c., have been burnt. It is in vain for the farmer to look for instruction on this to him apparent analogy in the pages of the Agricultural Journal; it is a practical point, and therefore not noticed. A luxuriating growth is undoubtedly produced, it is clear, not from the ashes—they contain so slight a trace of saline matter as to need no attention, and moreover produce no result,—is it from the salts liquefied by the heat absorbed in that state of the earth? The chemist of the Agricultural Society could, by analyzing carefully that portion of the soil and comparing with portions near, ascertain at once if that view was correct; or find perhaps, by further investigations, the cause of the powerfully permanent fertilizing agent thus produced; and such a study might lead to what would appear at present completely neglected, the scientific application of manure. The pages of the Agricultural Society appear filled, unfortunately, but with the wildest theories upon chemistry; in one volume we find a long article upon the feeding of cattle; it is there stated that starch and sugar of milk are of identical composition; had the writer ever seen sugar of milk, he would have known, that from the great proportion of salts of lime, it resembles considerably more plaster of Paris; a small portion only is soluble in boiling water: in fact two more different substances could scarcely have been selected. The comparative leanness of cattle during summer months is attributed to the muscular exertion required to drive away flies; while the perspiration induced by the warmth, the true cause, is passed as unworthy of attention. Trifling as these may appear, to the country farmer who is unable to detect errors, even when so apparent as these, such unguarded statements may prove of serious injury as encouraging him to useless expense.

Drainage is fortunately applicable to so many lands, that its indiscriminate adoption has not been attended with any evil result, and the depth of thirty-six inches would appear the most judicious standard, as not interfering with the ploughing or other farming operations. But in some lands, as at Oxford, it may well be doubted if any such system could be at all successfully employed; the soil, at the depth of a few inches, consists nearly entirely of flat pieces of magnesia and limestone, and this strata affords a mechanical impediment to the passage of water, and with the slightest descent the drainage must be of itself so perfect, that unless on a clayey soil the manure would be washed away. But in some lands, on the other hand, the benefit must be immense; indeed, it is our only hope of competing with the superior climate and soil of the Continent. In no part of Britain will it be more serviceable than in Ireland; the greater part of which consists of bogs, the result of their peculiar moist climate. We have seen land which lost more than half its weight by an exposure to a heat of 250°; seed could hardly fail to decay, when sown in such unfavourable circumstances; and as life and property become more secured, a great field will be here opened for capital; for land drained, rolled, and mixed with lime, in which it is singularly deficient, would yield several hundred per cent. The introduction of railways, by affording a market, must therefore prove of immense importance to this miserably cultivated country. The simple process of ascertaining the moisture of his soil, is one which any farmer could effect before his fire, and if the "Agricultural Journal" gave correct data, which the farmer could understand, its advantages would be more widely extended; he would at once see how well his increased product would repay the outlay, independent of the improvement in the health of his live stock, and, what is too often neglected, that of his own, and the health of his family and his servants. The simple examination by the thermometer would show him the difference of the temperature between the drained and the undrained land; the few degrees noticed will fully account for the growth of the corn in weather which, in the undrained, would produce a failure. These useful experiments cannot fail, however rude and unpractised the operator may be; but nothing can be more absurd than the attempts to simplify chemical analysis to the extent recommended in some recent agricultural treatises. In taking, for example, the specific gravity, the plan proposed is extremely simple, but for want of those cautions which a chemist invariably uses, the most erroneous results must be always obtained. A specific gravity bottle is recommended, to hold at a given mark 1,000 grains, when the soil is introduced to fill it from 500 grains to this mark, and the difference of weight gives the specific gravity. In the Treatise for which the Agricultural Society gave their prize, not the slightest allusion is made to the great source of error, that at the end of two hours the operator will be able to introduce more soil, and thus increase the specific gravity of that which he imagined he had carefully obtained. This is, however, a department the farmer can hardly hope to reach. An analysis, unless correct, is useless; but even where care has been taken to secure, by one skilled in analyzing, a correct result, the farmer is scarcely more advanced. He sees alumina, iron, traces of the phosphates, silica, and is completely perplexed at the complicated ingredients; the result of the analysis is to him nearly the same as when by the microscope the countryman first sees the globule of water magnified, with its myriads of inhabitants; the evidence of his eyes is hardly sufficient to convince him that he is in the habit of swallowing daily a liquid, every drop of which would appear sufficient to choke him. The analysis surprises the farmer, and he asks of the chemist information how to improve his land, and he is informed in reply, that the elaborate analysis has not nor could not enable him to give any opinion. The land of Bagshot, a barren and hitherto unreclaimable heath, is most rich in vegetable matter, and gives nearly the same results as the most fertile plains of Russia; and some land in Yorkshire, producing hardly sufficient to support a few geese, is precisely identical with some highly fertile land in Norfolk. The mechanical texture may differ; the situation, too, may exercise its influence: one may be sheltered from the cold winds which blight and destroy the other, or some agent may exist which chemical analysis may not detect, which the heat to which the soil is submitted or the acids employed may decompose, but which by improved methods we may hereafter find out and neutralize. It is better for chemistry to acknowledge that her first step is on a new path, that the ground must be carefully examined before any further advance is made, than to mislead, perhaps to ruin, those who confide in its professors. Great improvements may be made by following the plans laid down for the management of the manures, and the next step may perhaps reduce to equal certainty the treatment of the soil itself, though at present all is speculation. An error on this point has led to most serious consequences, and it has induced some to engage in expensive and fruitless undertakings. A professor, one of our first, whose works are in every one's hands, and whose lectures are always thronged with anxious hearers, acted upon the idea that, with his knowledge, he could render farming successful. He failed entirely, losing several thousand pounds; for that reason he has not published, what would have been most valuable as warnings, his unsuccessful experiments. But his want of success is not a failure of chemistry, though, because his successor, a plain farmer, was more fortunate, it is so regarded among his neighbours: the farmer was one accustomed to labour; with him no servant could shrink from his work, which, with the professor, occupied with other thoughts, there would have been but little difficulty in doing. The times, too, were adverse; and the injury done to the land by the experiment was probably not fairly stated by the incomer, who would naturally regard matters in their worst light. The true way would be to compare the professor entering on farming, with the farmer commencing an analysis: the countryman would scarcely, in one case, need more the assistance of the professor, than he did that of the experienced farmer when he entered upon his ill-judged speculation.

In the estimation of the value of manures the aid of chemistry is, however, indispensable: by it the farmer can safely assure himself that he is not made the victim of unprincipled adulteration. In Scotland, where the analyzing department has been thrown more open, and at a comparatively trifling expense the value of any manure can easily be obtained, it was found impossible to sell any spurious guano; in the English market it was greedily bought up, the test in England being simply the evolution of ammoniacal gas by treating the manure with quicklime. By mixing with the trash sold a solution of muriate of ammonia, it was easy to give a far greater supply of ammonia than the genuine guano, the efficacy of which appears to depend on the urates and phosphates with which it is surcharged. A simple stimulus of nitrate of soda is comparatively useless; the weight of the apparently luxuriant crop is not very materially increased, and unless the manure has those salts which the real guano possesses, the result on the vegetation of the next year is lamentably apparent. This has been most marked in some farms where, contrary to the advice of chemists, nitrate of soda was largely employed. Enormous quantities of this salt are found in America, and a very large quantity was imported on the speculation that it would supersede saltpetre, the nitrate of potash, in the manufacture of gunpowder; but, notwithstanding every care, it was found to deliquesce— to become moist; and therefore, for this purpose, it was valueless. The speculator instantly recommended it for a manure; and a clever agent travelled for it, and in an ingenious manner demonstrated its advantages before the astonished farmers by writing their names on the grass with a small pot filled with a solution of the salt. In the course of a week or two he called for orders, by which time the farmer was enabled distinctly to read his name in the luxuriantly growing grass. Large orders were in this way obtained; and the speculator disposed, to a great advantage, of his cargo. The next year the farmer was also enabled to read his name even more distinctly, but in a different and more unpleasant way, the writing being shewn by the absence of vegetation. Against such results chemistry is at least a guard; and, guided by her agriculture has here, within the last few months, made some great advances, particularly in the employment of fibrous covering.

(To be continued.)

A CHAPTER ON EYES.

Of all the various organs of sense, none have so frequently been the theme of a poet's laudations as the eye. Thus consecrated, by time and precedent, as the soft expressions have become, it would be difficult to select a page of rhyme, or rhythm, epic, didactic, lyrical, or dramatic, without finding some allusion to "burning glances," "gentle beamings," or some other poetical attribute of those highly prized, and certainly very beautiful little ministers to our noblest sense.

Well! surely they are worthy enough of all this praise; but if repetition be detractive of the beauty of a poetical sentiment, (and but few will doubt it,) then we cannot but admit that the eyes, as regards their poetic attributes, are a somewhat hackneyed theme. It has recently occurred to us, however, when musing in a kind of poetico-philosophical vein, that the subject of eyes is not yet threadbare; it has occurred to us that, without yielding ourselves up to that species of mental aberration which is usually termed poetical, without wandering in the world of dreams and spectres, and giving our imagination carte blanche over veracity, we might yet write a little about the eyes that is at once philosophical and poetical, and, strange enough to say, true withal.

To be serious! How beautiful is it to speculate on the nature of light! How delightful to trace the various forms of the visual organs as they appear in different animals, variously modified as they are to suit their various exigencies! How instructive to regard the clumsy means by which, in our optical instruments, we copy the effective, though simple handicraft of nature!

Understand our purpose well, then, reader. We do not intend to offer you any thing like a treatise on the eye, either anatomical, optical, phycological, or physiological; no, nothing of the sort. We are now in that kind of mood to which most of us are not strangers; too indolent to study, too fatigued to keep wide awake, yet too excited with philosophical musings to sleep, although ever and anon we sink into a kind of reverie. We could not for the life of us expound the rigid principles of a system—we are disinclined, in short, at the present moment, to direct our deepest, our most serious attention, to a philosophical subject; but we would fain amuse ourselves with it a little, and if possible we would also amuse you.

Very crude, indeed, were the opinions of the ancients with regard to the principle of light. Plato imagined it to consist of emanations from the eye itself, which by impinging on objects rendered them luminous; an idea poetical enough in itself, to be sure, but yet not very rational. It would serve, however, to render intelligible the expression of "burning glances," which, according to this Platonic theory, might be darted out from young ladies' eyes. Far more rational was the Pythagorean theory, that light, instead of being an emanation from the eyes themselves, was given off from luminous bodies, and impinged upon the eyes: this explanation is indeed the one now usually received, including as it does two rival theories, one that light consists of actual particles, the other that it consists of waves.

Whatever may be the intimate nature of light, whether it be really matter, or a motion amongst the particles of matter, or whether it be, according to Professor Oersted, merely a succession of electric sparks,—its optical agencies (which is all that now concerns us) are evident enough;—it acts in straight lines, penetrates some bodies, is retarded by others; is of three primitive colours, which were formerly erroneously supposed to be seven, and occupies in travelling a perceptible space of time.

In tracing the gradual development of organs throughout the animal kingdom, we shall be frequently struck with this fact, that as we proceed low in the scale of creation, functions which in ourselves require localized and complex organs, are discharged in a much more simple way. Thus, for instance, in all *mammalia* there is a localized respiratory system consisting of organs called lungs, for the purpose of purifying blood by means of atmospheric air,—indeed *all* vertebrated animals possess localized organs for this purpose, of one construction or another; but on descending the scale, we find that the respiratory organs, although still specific, become disseminated throughout the body: in the insect tribe of invertebrate animals, for example, breathing is carried on by various tubes on either side of the body: the air is no longer inspired through the mouth, but penetrates the sides; neither does it proceed to localized organs or lungs, but is diffused through the various breathing tubes. Hence the agony and ultimate death of a wasp, when its sides are smeared with oil or syrup, an operation which occludes its breathing pores, and it becomes suffocated. Here we observe one step towards the dissemination of organs for the performance of a specific function: let us descend lower still in the scale of creation until we arrive at the polyp, where there are absolutely no specific organs, either diffused or localized, for the performance of this specific function, and hence respiration can only take place by mere general absorption from the surface or the cavities of these animal bodies.

Now one of the senses, namely, that of touch, is remarkable for its known diffusion. Every part of our bodies is subject to this sensation,—we have no specific member for touch, although some parts of our body are more delicate in this respect than others. In some animals, however, this sensation is localized in a remarkable degree,—a fact which naturally leads us to inquire whether in certain beings it may not be limited to some specific organ.

Next comes the question whether or not other senses may not be subject to the same variation also,—whether, in short, referring to the sense now most specially under our notice, namely, the sense of sight, it may not be in some animals diffused, and require no specific apparatus for its appreciation? It is not doubted that many animals not possessing specific visual organs, without eyes in point of fact, are nevertheless sensible of the influence of the principle of light: the *veretillum cynomorium*, for instance, one of the polypiferæ, avoids the light, and prefers shaded situations, and yet has no eyes. Other instances might be adduced. It is imagined, therefore, that such animals see with their skin, a condition which, if true, in one particular animal or class of animals, may be supposed by some lusus or freak of nature to be occasionally present in higher creatures, for instance *man;* this granted, we may, if charitably inclined, offer this as a rational hint to the advocate of clairvoyance and mesmerism.

Leaving these beings, which, at the remotest confines of animated nature, derive their scanty sense of luminosity from impressions so vague that they defy our attempts at explanation, let us rise upwards in the scale of creation, and remark how variously the organs of vision are formed, how modified, how elaborated! until in vertebrata they attain their very acme of perfection.

Those persons who have not been accustomed to view the wonderful disclosures of microscopic life, are but little competent to form even an idea of the myriads of living beings existing in a mere drop of water!—Nay, even vegetable infusions, and most animal and vegetable liquids, teem with life! with minute beings, often highly organized, which have not been merely observed, but actually classified, and their characters and habits—nay, even their anatomy—minutely studied! *We* do not purpose classifying these minute creatures, but will content ourselves with the casual remark, that most of them, if we are to believe the united testimony of numerous microscopical observers, are possessed of actual organs of specific vision; simple, it is true, and limited as regards power, but nevertheless as localized and as distinct as our own. The eyes of these living beings are little red or darkish spots, adapted to absorb luminous rays, and therefore capable of enabling the animal to distinguish light from darkness, but nothing more; the perception on various tinted hues, and of form and outline, must be to these little beings totally unknown. Eyes scarcely more elaborate than these are found in the leech and snail, animals which, although so much superior to those just described in point of dimensions, are nevertheless but little better provided for in regard to their power of vision.

The eyes of insects are far more elaborate, and present two perfectly distinct varieties or type—they are either simple or compound. Nature, ever bountiful, though never lavish to prodigality of her endowments, gives organs only in proportion as they may minister to the exigencies of an animal: the red eyes of polygastric animalculæ, merely capable of distinguishing light from darkness, are abundantly sufficient for all the necessities of those little creatures; but for the denizens of the insect world—beings whose strength and agility are, in proportion to their size, superior to all other beings who wing their rapid flight, encompassed on all sides by ever-vigilant enemies of larger growth—another and more elaborate ocular apparatus is absolutely necessary. Their simplest eyes (for they have two kinds) are nearly as perfect as our own, consisting of cornea, lens, vitreous humour, and black pigment, which surround the other parts of the visual apparatus, except a minute portion in front, thus forming a pupil and iris—such is the *simple* insect eye with which some insects—for instance, the cockroach—are alone supplied. Now this eye, perfect though its optical arrangements be, is not imbedded in a moveable socket like our own; therefore Nature compensates for this defect by giving several of them, placed on various parts of the head. But the most wonderful arrangement consists in aggregating many of these simple eyes into one mass, thus forming a compound eye of many distinct facets, each of which takes in a separate field of vision. Some insects are entirely supplied with these compound eyes—of which the beetle is an example—whilst others possess eyes both simple and compound, for instance, the *sirex gigas*.

A microscope is not absolutely essential to enable us to see the facets of these compound insect eyes; most persons have looked upon the eye of a common dragon-fly, and seen that their own face was multiplied into a number of little images: the house-fly's eye presents the same appearance, but not so distinctly. This optical appearance depends upon the existence of several facets, each presenting itself under a different angle. By the aid of a microscope these facets have been counted, and then their number may well excite our admiration. In the ant there are fifty of these facets, or eyes; in the house-fly four thousand; in the dragon-fly *upwards of twelve thousand;* in butterflies *upwards of seventeen thousand three hundred and fifty-five* have been counted; nay, in some coleopterous or scaly-winged insects there have been numbered no less than *twenty-eight thousand and eighty-eight!*

How wonderfully constructed is this beautiful organ of insect vision! how admirably adapted to the necessities of insect life! The gaudy dragon-fly, presenting, as he does, such a conspicuous and tempting show of colours to the active swallow, eludes the feathered enemy by superior agility of flight. Mere agility, however, would avail nothing without the aid of powerful eyes; accordingly Nature has given him somewhat more than twelve thousand bright and piercing ones—some looking upwards, some downwards, more backwards, and some on either side. Beautiful though they be, and admirable in their contrivance, we must leave the compound eyes of insects, and ascend the animated scale. One step upwards brings us to the *arachnidans*, including spiders, and cheese mites, and scorpions, none of which little beings are insects, although frequently considered as such—they belong, as we have intimated, to the *arachnidans*, and differ from insects in several important particulars: firstly, their head and thorax are joined together; secondly, they possess eight legs, whereas insects have only six; thirdly, instead of antennæ, like insects, they possess terrific weapons of attack and defence—fangs like the spider, or pincers like the scorpion; fourthly, the greater number of them respire by lungs; and last, though not least, their eyes are formed on a different plan, being invariably simple, and made up of parts almost similar to our own.

Amongst the molluscous division of animals we have already alluded to the eyes of snails; in some other beings of this tribe, however, the visual organs present remarkable peculiarities. The cuttle-fish is an extraordinary instance of this—its eyes being entirely covered by the external integuments or skin, which is transparent, it is true, and thus serves the purpose of cornea in the higher animals.

We next come to the eyes of vertebrate animals, which present all the excellent qualities that the most acute optician could desire, and which are as infinitely superior to the clumsy devices of his art as the pure light of Heaven is superior to all other. One thing is particularly interesting in studying the optical devices of the eye—our most perfect optical instruments are formed after the exact principles on which have been constructed those organs: every step toward sthe improvement of such instruments has been the result of our copying Nature—or rather on our having followed Nature's steps—for although often plagiarists we were not always conscious of plagiarism.

In the days of Sir Isaac Newton, it was thought by this great man that refracting telescopes would never be rendered achromatic, or capable of representing white objects without colour—their improvement he pronounced hopeless. Opticians, as was natural enough, regarding the opinion of this great man as infallible, gave up the attempt, and made reflecting telescopes exclusively. Refractors, however, have since been rendered achromatic—and how?—why, by copying the mechanism of the eye. Nature suggested the means, but Newton did not take the hint.

We think the beauty of the eye will be more fully appreciated if we previously take a review of the construction and optical properties of telescopes. True, this will be a digression, but what then? we claimed a sort of poetical license in the treatment of our subject, and we will proceed to take it.

The merest tyro in optics knows that light when it passes through transparent bodies is refracted; if the refracting body be plane and of equal thickness, then will various rays of light be equally refracted; if, however, the body be not of equal thickness, whether plane or curvilinear, then other phenomena result, all explicable, however, by a consideration of two facts: firstly, that of the three primitive colours of which white light is composed, each possesses a different refractive power; secondly, that a ray of light impinging on a refracting body of greater density from one of lesser density, is refracted towards the perpendicular, and *vice versâ*.

Now, we take it for granted, that every body knows the property of a triangular prism in decomposing white light, and the reason of this property. This understood, what we are about to remark will be intelligible enough.

As soon as it was discovered that an arrangement of different lenses in a proper manner would make an instrument capable of rendering remote objects more distinct,—in other words, as soon as the discovery of the telescope was accomplished,—the observers viewed with regret that the outline of such objects was fringed with an unpleasant misty burr, more or less indistinct, and tinted with numerous colours. The removal of this imperfection was a great desideratum; and amongst others the celebrated Des Cartes imposed on himself the task of accomplishing this great end. He investigated the subject mathematically, and arrived at the conclusion that all lenses which were mere segments of spheres must necessarily possess this defect, inasmuch as their curve is such that they cannot possibly concentrate every ray of light, even of one colour, on the same point or focus. He therefore succeeded in determining the form of a particular set of ovals, (termed, after him, the Cartesian ovals,) out of which lenses might be cut which should be free from this injurious quality; and he succeeded to this extent,—that with one particular kind of primitive light his lenses overcame the previous indistinctness of vision: with compound light, however,—white light for example,—the imperfection still remained. Hence opticians no longer troubled themselves to make these Cartesian lenses; and even Newton subsequently pronounced the improvement of refracting telescopes *hopeless*.

Now the indistinct vision of which we have spoken is chiefly produced by the edges of a lens, which, in point of fact, may be regarded as prisms; consequently the imperfection alluded to, and called spherical aberration, may in great measure be obviated by cutting off those edges, or, what amounts to the same thing, by covering them with an opaque diaphragm, as is done in the microscope and telescope. This proceeding, however, does not totally overcome the evil. Newton, who discovered that the different colours of light were possessed of different amounts of refrangibility for the same medium, was not aware that different media possessed different refractive power for the same colour. Had he been aware of this fact he would not have pronounced the improvement of refractive telescopes *hopeless*. We will set out with the assumption that one kind of glass disperses one kind of primitive light—viz., for example, blue light—beyond the true focus; theory indicates that another lens of different glass, having a property (if such can be found) of dispersing the other two primitive colours, namely yellow and red, beyond the focus, would counteract the imperfection. Well this, in modern telescopes, is actually accomplished by using compound lenses made of various kinds of glass. We will, in our next paper, show how beautifully all this knowledge had been anticipated in the construction of the human eye.

(To be continued.)

ANASTATIC PRINTING.

MR. FARADAY'S LECTURE.

It would be idle, in our present state of knowledge, to discuss the advantages which have accrued to man from the invention of printing. The rapid reproduction of the copies of the works of intellectual men has necessarily produced an extraordinary impetus towards the attainment of those blessings which belong to our present moral and social condition; but we doubt much whether any such means as are now presented to us under the name of anastatic printing will be likely to add to our mental enjoyment, or to contribute to the prosperity or comforts of man. It is true that to circulate at the cheapest possible rate the opinions of the good and the wise carries with it many advantages; at first sight, however, they appear to be of more real value than they are. As long as education is considered to consist of teaching how to read and write, a multiplication of copies will be more injurious than useful; for, unfortunately for society, the greatest number of works printed are those which tend least to its good. For one work of sober truth, hundreds of imaginative nonsense are given to the world, and they are by far the most likely to captivate the mind, enfeeble it, and render it little capable of digesting the solid food which, amidst a mass of trash, is offered to it. If the mind received its proper direction before tales, novels, and romances were permitted to be read, there would be in all departments of life a more rational view of our condition here, more decided attempts to improve it, and those views of a hereafter so inculcated that they would lead to a greater struggle after virtue in this life than at present exists. It is almost painful to witness the avidity with which the young mind drinks in, in England, the fictions which have been so industriously furnished it by the popular writers of the day. Such has been the success attendant upon the imaginative works of our times, that unless history and biography be exaggerated and dressed up with all the fantastic colourings of romance, they cannot be read; the works of sober truth slumber in undisturbed tranquillity upon the bookseller's shelf, whilst a caricatured Life of Cortes, of Warren Hastings, or of a Hildebrand, is earnestly read, and the wild lucubrations of an eloquent enthusiast carry with them charms which shed a magnificent splendour over decided falsehood.

Previously to the introduction of printing, there was a laborious effort made by master-minds to become intimately acquainted with the thoughts and language of a favourite author, which was carried out by transcribing the original. Thus did Petrarch become intimate with Virgil, and in the Ambrosian Library exists the monument of the admiration of one genius for his predecessor. The three distinguished monastic bodies, the Clugni, the Carthusians, and the Cistercians, which were under the Benedictine rule, became remarkable for their deep researches into classic literature, and for their labours in its diffusion. It is true, that a large portion of a man's life was sometimes devoted to one work, but it was the sacred volume. Guido de Jais began with his own hand a Bible, in his fortieth year, and had not concluded it till he had become an octogenarian. The plan pursued in Rome appears to have been that a reader should be surrounded by scribes, whose occupation it was to write down the sentences pronounced; and in this way several hundred copies might be taken at once; and though from this circumstance great inaccuracies might occur, yet this was, upon the whole, the means by which there was a rapid diffusion of a book. We find that Atticus was remarkable for his collection of learned slaves, whose duty it was to write and to read for him, and that he assisted Cicero in collecting a library. The great men of the age seldom read themselves, but a well-tutored slave was always in attendance, and the lowest of the domestics were generally well educated.

Of the legendary tales which invest the first invention of printing little now need be said. Many cities have contended for the honour of nurturing the first inventor. To Gutenberg, of Mentz, to Faust his associate, and to Schœffer, may, however, we think, be ascribed the priority. They have been called the grand typographical triumvirate, and the rapidity with which their efforts were followed by others has, doubtless, thrown some difficulty upon the elucidation of the question as to whom the first honours are due.

The first efforts were necessarily rude; works were slowly given, in comparison with what is now effected. A single press could not furnish above 250 impressions in the hour, until steam was brought to bear. The "Times" was the first paper that availed itself of the labours of Mr. König, a German, who fortunately met with the enterprising conductor of that journal, Mr. Walter, in the year 1814. The first copies were thus produced, 1,800 copies being printed off during the hour. Further improvements have been made, by which upwards of 12,000 impressions are given out.

Stereotype printing is a process by which plates are formed from the types set up, capable of producing an infinite number of copies; of these some printers possess an enormous stock, which the introduction of anastatic printing will render almost useless, for by its means the process will be altogether rendered unnecessary.

Mr. Faraday commenced his lecture at the Royal Institution on Friday evening last, by expressing his fears that, not being in any way connected with the subject, he might not plead so zealously in its favour as he did when he brought before them his own inventions; but if he did not render the subject quite clear, it was to be considered as entirely his own fault, the inventor having placed every information at his disposal. He hoped to be able, even during the short time allotted to the lecture, to show practically the process, as the workman, extremely skilful in the science, could show practically the working. The word "anastatic" signified, he was informed by scholars, a raising up; in other words, a revival of what might be considered as dead and useless. Having given this definition of the name, before showing its workings, he had most distinctly to repudiate the slightest intention of in any way recommending it or pledging himself for its success. However it might eventually turn out, his opinion could never be brought against him, for he had given none. He considered this caution necessary, as he found his name constantly brought forward as recommending this theory or that theory, or identified indeed with things with which he had not the slightest acquaintance. That very day, indeed, he had received a letter upon his supposed advocacy of perpetual motion. His duty was but to explain, as clearly and briefly as he could, the invention now before them. It consisted in a plan of printing from a printed page, or an engraving, any number of copies. He would, to show the principle, take at random a leaf from the book, and give it over to the worker, and they would see the process in all its stages, They would observe that he wetted first the print freely with dilute nitric acid. (The proportions the lecturer did not state, but we should judge its strength to be at least one of acid to four of water.) This was allowed to stand for some time—a few minutes would be sufficient in the present case; and they would next remark the extreme care of the worker to remove the excess of acid. This was effected by pressure between sheets of bibulous or blotting paper; this sheet was then placed upon a plate of polished zinc. He would draw attention to the extreme care with which the worker was polishing the plate; the slighest speck would be sufficient to injure the impression. His hearers would now see the system; the acid would soak through the paper, but on those places where the printing was the acid could not penetrate. Printers' ink, as they were aware, was composed of lamp-black and a preparation of linseed-oil, and this effectually defended the plate from the acid. "The wetted paper and the plate are then submitted to heavy pressure between two rollers, and the plate is, as you see, strongly acted upon by the water; it is now washed with gum-water, and this, though an apparently unimportant part of the process, is of great practical importance; it would appear to have a most decided repulsive action on the ink. The plate can now be submitted to the action of the inken roller; the parts protected by the printing will alone receive the ink, and in order to render this more decided, the zinc plate is now washed with phosphoric acid; the action of this acid is exceedingly obscure; the phosphoric has no advantage over the nitric or muriatic, but the difference where the phosphoric is used is exceedingly apparent. Phosphoric acid is easily made, by leaving phosphorus in water exposed to the action of the atmosphere; the phosphorus absorbs oxygen, and forms the phosphoric acid. The worker, you see, uses considerable force in his operations with the gum-water and the phosphoric acid; his experience has shown him that the printing ink adheres now with some firmness, and you will be able to see the process of the printing. I hand over to the chairman, as your representative, the impression just worked off; you will, after the lecture, find it perfect. But it would be unfair to judge of the practical working by the process now working amidst the excitement and bustle attendant upon the lecture. I will now call your attention to the repulsive action of water and oil. You are aware that when two smooth surfaces wetted with either oil or water are pressed together, they cohere with considerable force; there is but little difficulty in sticking them together, though my strength is hardly sufficient to tear them apart; this is not, as was formerly supposed, the cohesion of the surfaces, but the attraction of particles of water for water. We are indebted to Dr. Henry, of America, for the peculiarly instructive papers and experiments he has published, which, though out of place here, I hope, ere the season closes, to have the pleasure of again alluding to. (Great applause.) I will pour upon this plate some coloured water, and drop on it some oil: the water is, you see, driven to the sides; and this effect is even seen more strongly when I cover first the plate with oil, and pour on the water: it slides, as you see, over the plate; each, as it were, keeps possession in defiance of the other, the first applied holding possession; and this is probably one cause why, after so many impressions, the printing keeps distinct, the repulsive action of the water pressing up the ink in place of allowing it to spread, even though it remains for some time soft. The possibility of taking impression by pressure has been well known a long time: by rubbing this newspaper strongly, with a piece of wood, against this damp paper, I can obtain a very fair impression, though the force I can employ is of course not for a moment to be compared to the even and powerful pressure of the printing press. Now metallic plates resist strongly water when very highly polished, though, as you observe, I may pour water on this plate: its surface is not tarnished; the water moves lazily, like a slug, upon its surface. A little mucilage will at once remove this difficulty; the gum enables it to spread smoothly over the surface. There is not quite sufficient mucilage here, (this experiment failed,) but on the addition of a little more the effect is at once apparent. But I will play further tricks with this plate; I will direct the man to rub off the impression from the plate,—and this can be done easily by turpentine,—and the plate will be to all appearance as before it was first submitted. Before doing so I will have first the plate entirely inked over; every part is now covered. I place my finger on any part, and you observe it covered with the ink, marking whatever I now touch. The worker will rub it with his cloth, and take an impression. You will observe that the rubber has moved the ink only from those places to which it was not first applied, and the printing is as clear as before. He will now move off the ink entirely, and you would believe that the plate was now destroyed: but no; the parts, once inked, though every atom of grease has been removed, will still receive only the ink, while the other parts will, as before, reject it; and again, you see, the printing goes on without hindrance. Eight thousand impressions have been, we believe, taken, without the slightest difference between the first and the last in point of deterioration: indeed the order of perfection is generally reversed, the first being the most incomplete. In the copying by this process the old printing, there was a great difficulty presented by the dryness of the ink, which becomes nearly brittle: to remove this the paper was sponged with a solution of potash: this would soften the ink. The potash was afterwards removed by soaking the paper in a solution of tartaric acid. The paper becomes covered with the glistening crystals of bitartrate of potash, cream of tartar. These crystals refuse to mingle with, or to receive, the ink of the printers; and the printed parts alone receiving it, a very excellent impression can be made by re-inking the print before it is applied to the plate. A few specimens are before you: their genuineness is at once apparent from the style of the type, which no printer of the present day would use."

Mr. Faraday concluded his highly instructive lecture by returning his thanks to the inventors for the facilities and assistance they had given him.

Among the objects of interest exhibited in the reading room, were some very rough illustrations of Professor Wheatstone's moving figures—red figures on a dark ground.

ARCHIMEDEAN RAILWAY.

Mr. Farrell, the inventor of this curious system, exhibited a model at the Dublin Society's house during the late cattle show, and delivered a lecture on it in the gallery, which was densely crowded, on Wednesday the 23rd ult. After alluding to the great advantages which have arisen from the invention of railways, and to the merits and demerits of the various plans, Mr. Farrell, pointing to his model, said:—

"I have given this invention the title of 'Archimedean,' from some resemblance that it bears to the water-engine, invented by the celebrated Archimedes, which appears to have been a tube coiled spirally round a cylinder; but as a cylinder of eighteen inches diameter would be expensive and cumbrous, I substituted a comparatively small shaft of iron-tubing of about four inches diameter, and the spiral or thread of the screw I support by wrought-iron arms of sufficient strength, keyed on the shaft and bolted to the spiral. The screw propeller thus formed is made in separate lengths of from twelve to fifteen feet, and connected by couplings at each joint, that allow a sufficient freedom to meet any accidental sinking of the rails, or any required divergence from a straight line. These lengths rest on metal-bearing saddles that are bolted to the cross-sleepers of the railway. This screw propeller is laid down in the middle of the track, and caused to revolve upon its axis by steam or water power, and, when revolving, the spiral rail presses against a pair of wheels that are suspended from the frame of the leading carriage of the train, one wheel being at either side of the axis of the screw; so that while the carriage is propelled forward by the pressure of the spiral against the periphery of one of the wheels, it is prevented from acquiring accelerated motion or running irregularly forward by the other wheel, which follows and presses against the spiral on the other side of the axis, and thus aids in giving a revolving motion to the screw propeller. These wheels, which form the only connexion between the trains and the propeller, are perfectly under the control of the conductor, who, by turning the handle of the vertical screw can raise them up, and thus disengage them from the propeller, and, by continuing the same action, can apply the breaks to the bearing wheels, and thus stop the train at any point of the line. It is proposed that the stationary engines be placed three miles apart, and that each engine shall turn a mile and a half screw propeller in each direction from it; the power will be communicated from the engine by means of a friction-clutch, let into a cylinder cast on the back of the spur-wheel. By this means, should the shaft meet with any accidental obstruction, it will be saved from any strain. Thus far this invention is applicable to any existing railway; the propeller can be laid down and secured to the cross-sleepers of the railway, and the propelling wheels and lifting apparatus attached to as many of the carriages as would be required for leading carriages. The model, however, embraces another improvement. It may be seen that the wheels have no flanges, and there is a pair of friction wheels at either end of the carriage that run against the centre guide rail, that rests on, and is firmly secured to the apex of the triangular bearing saddles which support the propeller.

"The advantages I expect to be derived from this invention are economy in construction, economy in power for locomotion, and facility for transmitting frequent trains with perfect safety.

"The facility which the Archimedean possesses for ascending inclined planes, places it on a par in this respect with the atmospheric system, by which, as I have before shown, a saving in construction to the amount of 4000*l*. per mile may be effected, taking the estimate of the Irish railway commissioners as our standard. The relative estimates will stand thus: locomotive railway, 13,000*l*. per mile; atmospheric railway, including the tubes for double line, 18,000*l*. per mile; Archimedean, including the propeller for double line 11,000*l*. per mile; these amounts are given, it will be remembered, as merely comparative estimates. On the Archimedean system, therefore, the saving in the cost of construction, when compared with the locomotive, is 2,000*l*. per mile, and compared with the atmospheric, 7,000*l*. per mile of double line. With respect to the cost of locomotion, it will be sufficient for our purpose, as I have before stated, that the locomotive and the atmospheric systems might be considered nearly on a par as to annual expense, to compare the Archimedean with the locomotive system.

"As the power is conveyed directly from the prime mover to the trains by means of the screw, I cannot conceive that there is any power lost, except that which is absorbed in turning the screw propeller and keeping it in motion. The weight of a mile and a half propeller is about eighty tons. If we allow the power expended in turning this amount to 10-horse power, (and by the use of friction rollers this might be greatly reduced,) as I propose a 20-horse engine to each three mile station of single way, and two such engines on a double line, which could work in concert, each engine would, therefore, have a spare power equal to the propulsion of more than 30 tons, at the rate of 20 miles an hour; and as trains might be transmitted in rapid succession without danger of collision, trains of 20 tons might be transmitted at the rate of 30 miles an hour without increasing the engine power, and thus meet the demands of the most extensive traffic, at a cost considerably under one-fourth of the expense of locomotive power on the present systems. The saving would therefore be on a railway 100 miles long, 200,000*l.* in the cost of construction, which at five per cent. is 10,000*l.* per annum, and on the cost of locomotive 75,000*l.*, making a total annual saving of more than 80,000*l.* per annum on a line of 100 miles in length, of very extensive traffic." Mr. Farrell concluded by stating that, startling as those calculations appeared, he was persuaded they would be borne out by results.

SOCIETIES.

Geographical Society.

April 14.—Sir John Rennie, V.P., in the chair.

The first paper read was an account, by Mr. E. J. Eyre, of his exploration of the lower course of the Darling River, Australia. On the 4th of December, 1843, Mr. Eyre left Morunde, accompanied by Mr. Scott, one policeman, and a native of Morunde, each mounted, and a pack-horse carrying provisions. Proceeding up the right bank of the Murray, the party arrived at the Rufus on the 8th of December, from whence they struck across the scrub to the Darling, crossing a large Ana* branch of that river, running through the scrub half way between Lake Victoria and the Darling, with a course of full sixty miles nearly parallel with the river. On the 12th of December Mr. Eyre struck the Darling at a point seventy miles above its junction with the Murray. There was less water in the Darling than might have been anticipated, from the length of its course: its banks were lined with beautiful gum trees.

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* Term now used to designate an anastomosing branch—i.e. a branch which, after leaving a stream, falls into it again, forming what is termed in physical geography a branch island.

Fifty miles further up they came to another Ana branch of the Darling, but having much water only in times of flood. Proceeding four miles further, they had a fine view of the ranges laid down by Major Mitchell to the west of the Darling; the intervening country seemed low, and subject to inundation. At this place indisposition compelled Mr. Eyre to return. Proceeding down the Darling, he and his party passed over all that part of the river's course left unvisited by Major Mitchell, and thus connected the two lines of that traveller, only on the opposite side of the river to his track. From the natives Mr. Eyre learned that the Laidley Ponds are a chain of sheets of water, connected by a running stream, and falling into the Darling at a place called Wēēl-yŭrărăh; they said it came from the hills, and that water was to be found all the way from the Darling to Mount Bryan under these hills, by which route the natives frequently crossed backwards and forwards, though Mr. Eyre supposes in the winter season. In the course of this excursion the travellers had occasion to notice the very beneficial influence exercised among the natives by the Government establishment at Morunde, and which, in a greater or less degree, extends to the furthest point reached in this journey, or 330 miles from Morunde. The many natives they met with on their route behaved in so friendly a manner, that they found it unnecessary to keep watch at night. Having thus explored the road, the fact of so small a party as Mr. Eyre's having passed in perfect safety among such numerous tribes of the Darling, once so hostile, warrants the conclusion that a safe and practicable way is now open for further future expeditions.

The second paper read, was Notes of an Excursion from Batúm to Artvin, by Mr. Vice-Consul Guarracino. The traveller's route lay through the left or western bank of the Jurúk, in a northerly direction, He accordingly first went round from Batúm to Kizil Toprak, crossing the river in a ferry boat. The Jurúk at this place was only thirty yards broad, and seven or eight feet deep, but from May to the middle of September its width is frm 200 to 300 yards. Passing through forests and undulating ground, the traveller reached the village of Omboli, of thirty well-built houses, contiguous to a large forest of oak, chestnut, and alder trees. Some way further on, the Adjarah Sú comes in from the east. Passing the village and stream of Miruvet, M. Guarracino came to the large village of Maradiet, with a bazaar of seventy shops, supplied in small quantities with every kind of European manufacture. Another ravine being crossed, Kadapha was reached, containing upwards of 200 houses. The natives here, who are Mussulmans, and very civil, collect a little wax and honey, and grow a little barley. Leaving this place and passing, first, along through narrow fields between the Jurúk and the foot of the mountains, and then ascending the heights, the traveller reached Botchka, of about ninety houses, several of which are of stone, and built in contact with each other. The natives here make bricks and earthen jars, with which they supply the whole coast between Rizeh and Jurúk Sú. They are also the boatmen of the river, on which there are about eighty boats. After quitting Botchka, passed an old fort said to be Genoese, and crossed by a stone bridge the Itchkaleh Sú, coming in from the west. The next place reached was Ziruret, where large quantities of tiles are made. A mile beyond this place, the Murghur Sú was crossed, a western affluent of the Jurúk, forming the boundary between the provinces of Lazistan and Jivaneh, and after passing Dampal and Omanakhan and the ravine of Hatit Derah Sú, the traveller arived at Artvin, the whole distance being about sixty miles. Artvin has the appearance of a large village; the houses are built of wood and separated by gardens, planted with mulberry and olive trees. The population is reckoned about 5,500, Catholics being more numerous than Turks. The industry of the town, the manners and customs of the inhabitants, the principal buildings, some being of stone, the trade, &c., of Artvin, were described in the paper, which concluded with a general view of the neighbouring Pashaliks.

ROYAL AGRICULTURAL SOCIETY.

The meeting this year is to take place in the month of July, at Shrewsbury; the prizes are not very different from those which have been offered on previous occasions.

For the Plough best adapted to heavy land—*Ten Sovereigns.*

For the Plough best adapted to light land—*Ten Sovereigns.*

For the best Drill for general purposes, which shall possess the most approved method of distributing compost or other manures in a moist or dry state, quantity being especially considered. N.B. Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited—*Fifteen Sovereigns.*

For the best Turnip Drill on the flat, which shall possess the most approved method of distributing Compost or other manures in a moist or dry state, quantity being especially considered. N.B. Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited.—*Ten Sovereigns.*

For the best Turnip Drill on the ridge, which shall possess the most approved method of distributing Compost or other manures in a moist or dry state, quantity being especially considered. N.B. Other qualities being equal, the preference will be given to the Drill which may be best adapted to cover the manure with soil before the seed is deposited.– *Ten Sovereigns*

For the best Scarifier.—*Ten Sovereigns.*

For the best Chaff Cutter.—*Ten Sovereigns.*

For the best Machine for making Draining Tiles or Pipes for agricultural purposes. Specimens of the tiles or pipes to be shown in the yard: the price at which they have been sold to be taken into consideration, and proof of the working of the machine to be given to the satisfaction of the judges.-- *Twenty Sovereigns.*

For the best Harrow.—*Five Sovereigns.*

For the best Drill Presser depositing manure and seed.—*Ten Sovereigns.*

For the best Churn.—*Five Sovereigns.*

For the best Weighing Machine for live cattle and farm produce generally.—*Ten Sovereigns.*

For the best Steaming Apparatus for roots.—*Five Sovereigns.*

For the best One-way Plough.—*Five Sovereigns.*

For the best Skim or Paring Plough.—*Five Sovereigns.*

For the best Subsoil Pulverizer.—*Ten Sovereigns.*

For the best Clodcrusher.—*Ten Sovereigns.*

For the best Horse-Seed Dibbler—*Fifteen Sovereigns.*

For the best Hand-Seed Dibbler—*Five Sovereigns.*

For the best Linseed-Crusher—*Ten Sovereigns.*

For the best moveable Sheep-fold—*Ten Sovereigns.*

PRIZES FOR CHEESE.

To the exhibiter of the best hundredweight of Cheese (of any kind) made within the district—*Ten Sovereigns.*

To the exhibiter of the second-best ditto—*Five Sovereigns.*

PRIZES FOR SEED WHEAT, BARLEY, AND OATS.

1. Fifteen Sovereigns, or a Piece of Plate of that value, will be given to the exhibiter at the meeting at Shrewsbury, of the best 14 bushels of White Wheat, of the harvest of 1844, and grown by himself.

2. Fifteen Sovereigns, or a Piece of Plate of that value, will be given to the exhibiter at the meeting at Shrewsbury of the best 14 bushels of Red Wheat, of the harvest of 1844, and grown by himself.

3. Ten Sovereigns, or a Piece of Plate of that value, will be given to the exhibiter at the meeting at Shrewsbury of the best 14 bushels of Spring Wheat, of the harvest of 1844, and grown by himself.

4. Ten Sovereigns, or a Piece of Plate of that value, will be given to the exhibiter at the meeting at Shrewsbury of the best 14 bushels of Barley for malting, of the harvest of 1844, and grown by himself.

5. Ten Sovereigns, or a Piece of Plate of that value, will be given to the exhibiter at the meeting at Shrewsbury of the best 14 bushels of Oats, of the harvest of 1844, and grown by himself.

Competitors are requested to send with their Wheat, Barley, or Oats, specimens, fairly taken, of the same in the ear, with the whole of the straw, in a sheaf not less than one foot in diameter, and with the roots attached.

[Twelve bushels of the Wheat, Barley, or Oats, will be sealed up by the Director or Stewards, and one of the remaining bushels of each variety will be exhibited as a sample to the public; the other being kept for comparison with the produce of the next year. At the General Meeting in December, 1846, the Prizes will be awarded.]

The two best samples of each of these classes of Wheat, Barley, or Oats, without at that time distinguishing, in any of the cases, between the comparative merits of either sample, will be selected by the Judges appointed for the meeting at Shrewsbury; and will be sown, under the direction of the Council, (the Winter Wheats in the autumn of 1845, and the Spring Wheat not earlier than the 1st of March, 1846,) by four farmers, who will make their report, upon which the prizes will be awarded, provided there be sufficient merit in any of the samples. Ten Sovereigns will be given at the meeting at Shrewsbury to each exhibiter whose Wheat has been selected for trial, and Six Sovereigns for the Barley or Oats.

INSTITUTE OF BRITISH ARCHITECTS.

April 14.—H. E. Kendall, Esq., V.P., in the chair.

A PAPER was read, "On the Formation of a Museum of Casts, illustrative of the Architecture of Antiquity and of the Middle Ages," by C. H. Wilson, Esq. In this essay Mr. Wilson cited the casts belonging to the Royal Society of Arts at Edinburgh, as a model for similar collections, which might be established in various localities throughout the kingdom with great advantage to the public taste, and consequently to the general promotion of Fine Arts. With reference to architecture, there were difficulties to be overcome, since the true mode of making architectural casts really available for study, would be to set up the orders of antiquity, and even the façades of whole buildings, entire, instead of keeping them in fragments, and for this purpose space would be required which it might not be easy to obtain. This plan has been carried into effect at the Ecole des Beaux Arts at Paris. Some observations followed on the true advantage to be drawn from collections of works of art of different styles and periods, which were too generally used as mere objects of imitation, instead of being made available as a study of the resources of art, under various circumstances and contingencies; —that there is one standard of beauty and taste, must be inferred from the fact, that all schools of art, whatever modifications their practice may exhibit, have agreed unanimously in their admiration of the works of the Greeks. In the present day, the arts, and especially architecture and decoration, are too much confined to imitation, both in England and France. The Germans are struggling, and not unsuccessfully, to unite beauty of proportion and form, with a style bearing the impress of a national character. Mr. Wilson observed, that much bad art was perpetrated in this country upon the pretence of carrying out the style of the Middle Ages—a very convenient doctrine to those who find it difficult to draw or design. Mr. Donaldson, considering synchronism and uniformity of character to be essential in the reproduction of various styles of art, thought that collections of the works of all periods could not be too much extended, or too assiduously studied. He deprecated the study of art of any exclusive character, and believed that no advantage whatever had accrued to British art from the acquisition of the Elgin Marbles.

THE WATER COLOUR EXHIBITIONS.

The two Societies of Water Colour Painters, old and new, have opened their doors during the past month. They both present a goodly array, and have been honoured with a good number of visitors, who have extended their patronage beyond the shilling paid at the door, a considerable number of the works being already ticketed with the agreeable word "sold."

On comparing the two exhibitions, we cannot but remark a very distinct feature between them, in the high aspiring of the "New" Society in attempting in so many instances historical subjects, whilst their elder brethren are for the most part content with the original, and, as we think, true purpose of this agreeable but humble art, namely, the painting of landscapes, fruit pieces, and minor subjects of domestic life. There are many reasons which could be urged why water colour painting should not be strained to these higher efforts; but perhaps the most conclusive and satisfactory is that which may be said of the subjects themselves, namely, that the highest and grandest subjects, to be done justice to, should be done in the highest style of art, and therefore that if an artist has a grand conception for a great historical subject, he does his imagination and poetry a wrong in producing it in the limited scale, and with the weaker and transparent materials, of water colouring. On the other hand, if the water colour painter is not gifted with a grand conception of a subject grand in itself, he exposes himself to unfavourable criticism, both for his subject and his treatment, by attempting the historical at all. All this appears to us so obviously true, that to proceed with further argument in support of the position would be a misapplication of materials and purposes similar to that which we charge against these very gentlemen.

Not to go through the story of all these historical efforts, we must just point to Mr. Warren's two; "The First Sight of Jerusalem," which is all confusion and patchwork in drawing, transparent and bodiless in colouring, in fact without a pictorial tone in the one, or concentration of interest in the former respect. His "Christ and the Woman of Samaria," is a poor, cold, undignified affair; an evident imitation of the present Foreign School. This artist has, however, one or two landscapes and domestic pieces (as the Miller's Maid, after Crabbe,) which show he has not quite lost his former cunning, and the more appropriate and pleasing application of his art. Mr. Haghe's picture of "Ferdinand visiting Rubens at Antwerp" is wonderfully painted, coming up just so near in richness to oil painting as to show us the absurdity of the attempt, and makes us regret that much good time and excellent talent should have been so misapplied. Of Mr. H. P. Riviere's "Pope Gregory and the Saxon Slaves" in the Roman Forum, we have a similar remark to make, though the colouring is by no means so gorgeous. Mr. Campion's "Battle of Waterloo" is a lame and impotent affair, coming in for still stronger denunciation. Mr. Corbould has a striking and a pretty picture from the "Wandering Jew," representing a veteran leading his warhorse, on which are seated, nestling together, his two weary orphan daughters. The figures have been wrought with great finish and study, and though rather theatrical in effect, the picture is a creditable one. In Mr. Wehnert's "Bianca and Lucentio," (the Latin construing lesson from the "Taming of the Shrew,") the lady is exquisitely pretty, but supremely insipid; Lucentio much too old and grave for the romantic part he plays. By this same artist we have another picture, which is to our taste the best in the room. It represents "The Prisoner of Gisors" carving rude sculpture with a nail on the walls of his dungeon. The intensity and abstractedness of the wretched solitary's expression are admirable; and the tone of gloom of the whole is skilful and truthful. A word of compliment at parting to the landscapes of Messrs. D. Cox, junior, Youngman, Jutsum, Duncan, Fahey, and others, and the sea pieces of Messrs. Cullon and Robins. The old Society of Water Colour Painters opened their gallery so very late in the month, namely the 26th, that we can only say a few words of the general excellence of their display, chiefly, as we said, the landscape department. Copley Fielding, a host in himself, presents us, as we should guess, some score or more of such pieces, all painted in his usual felicitous style. We would particularize for favourable notice his No. 25, "The Forest of Loch Tulla," in Argyleshire; No. 58, "Glen Lochy," in Perthshire; No. 121, "View of the Summit of Snowdon;" No. 161, "Vessels in a Gale," off Filey Bridge, Yorkshire; and No. 227, "A View near Cuckfield." Harding has a magnificent picture indeed, "Berne, Switzerland,—Morning, as it sometimes wakes amongst the Alps," which, perhaps, for elaborate detail, and wonderful ærial effect, may be pronounced the finest work in the whole exhibition. C. Bentley's landscapes and shipping pieces are excellent for the truthfulness of their tone, and delicacy of detail. Cox's landscapes must also be spoken of with honour. P. D. Wint has an affectation of broad patches, and striking contrasts of colour and lights and shades, which a little mars the efforts of a promising pencil. Prout, with his eternal exteriors, with blue and pink blinds, and red and yellow figures, has become a mannerist. So has Cattermole, with his theatrical groupings; and so has Hunt, with his eternal ugly boy, whom he seems to never tire painting from in all sorts of absurd occupations. The last named artist has now in addition taken up an old and well hackneyed trick, which he has repeated in this exhibition in no less than three instances, namely, the light of a candle or lamp, shaded from the eye of the spectator, and thrown theatrically upon a girl reading, writing, or selling fruit, as the case may be. As long as we have real and original merit amongst us, these are expedients rather to be avoided than encouraged.

MISCELLANEA.

SOFTENING STONE.

Whilst Sir William Burnett has been converting wood into stone, another ingenious philosopher has been turning stone into a state of almost fluidity. Mr. Ransome, an engineer at Ipswich, has brought stone almost to the consistence of paste, so that it can be moulded into any shape; it afterwards becomes hard and resumes its original character; it will receive a polish, and can so varnish wood as to render it fire proof.

WIT, ELOQUENCE, AND POETRY.

BY THE AUTHOR OF THE POEM OF "THE BATTLE OF LONCARTY," THE COMEDY OF "THE GOLDEN GLOVE," &c.

WIT[a].

Wit is a brilliancy of intellect that colours all things that pass through the mind with its own brightness. It developes itself in sprightly and pointed dialogue on every subject presented to it, and occasionally bursts forth, like the exploding rocket, with a brilliancy that surprises and delights the hearer.

Those sallies are called strokes of wit; and a genuine stroke of wit consists of some strong point of truth and sense not generally observed, unexpectedly expressed in words that tend to surprise and please the hearer.

Wit is not the produce of study: it comes almost as unexpectedly on the speaker as the hearer: one of the first principles of it is good temper; the arrows of wit ought always to be feathered with smiles; when they fail in that they become sarcasms.

A permanent and leading principle of wit is sound sense; without a footing in that, its shafts not only fall short of their mark, but recoil with discomfiture on him who attempts to launch them.

Another leading principle of wit is, that it must never take help from profane or immoral allusions: nothing can more clearly evince the absence of genuine wit in any person than the descending to profane or obscene insinuations to eke it out with.

Our public wits in former times left their fame under great drawbacks with posterity on that score: from the first rise of literature in this country, our leading wits, our dramatic poets, seem to have held obscenity as a stock commodity to appeal to when their dialogues flagged, without seeing the degradation of it; the consequence of which is that, after the taste of more polished times extracts from their works all that is foul and offensive, there is but little left in the productions of many of them to preserve their life in public fame; and, therefore, the works of almost all of them, though fraught with powerful genius in other respects, are become a dead letter to the modern stage.

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[a] The question "What is Wit?" was put to me one evening at the house of a friend, where I dined, in the year 1815, when the first version of my Comedy of the Golden Glove was published, by an elderly gentleman who sat next to me at table, and who was one of the many who at that time were struck by the appearance of the play. I felt flattered by the question, from a person so much my senior, and immediately answered, that I thought wit was a ready use of sense, put forth unexpectedly, in a few words, that struck the hearer with pleasurable feelings; which brief definition I afterwards amused myself by a little further illustrating as above.

Another leading principle of genuine wit is, that it must never trespass on private friendships: when it does that, it becomes a libeller or a bully. There is a saying that "some men will have their jest, if they lose their friend." Such persons are to be looked upon as children playing with sharp weapons, insensible that they cut.

In fine, persons gifted with the high talents of genuine wit, will fall into none of the above errors; they will find abundant materials in the general manners and transactions of life to exercise their gifts on, as far as they can be useful or entertaining to society; and that is the grand criterion by which the study or exercise of wit ought to be guided.

ELOQUENCE.

Gifts in eloquence are superior to gifts in literature, because they are the more immediate and direct agents in the government of mankind.

Though literature is often the root and foundation from which eloquence derives its materials; it is the orator who best applies those materials to the ever varying occasions of society.

Gifts in public speaking are also generally more advantageous to the individual who possesses them, than gifts in literature; the great writers who have from time to time appeared in the world have obtained high fame and honour; but where are their families and descendants? Gone! all gone to oblivion; while the descendants of orators in the senate and at the bar are reposing on their large estates, and lolling in their coroneted carriages.

It is through the power of eloquence that laws are made, and it is eloquence that regulates the uses of them. Literature has its advantages; because it may be far more widely spread without its sense being perverted or vitiated, and it yields to those gifted in it a more pure and enduring fame.

Eloquence is the art of persuasion. The first principles of it are a clear knowledge of the subject under discussion, with a sound judgment in the chain of argument, and emphasis.

The second is a bold, fearless, and energetic delivery of arguments as they rise.

These are the two first great principles of eloquence: they are indispensable to it: and if possessed in an eminent degree, will accomplish a public speaker without any thing further: they are the grand leading materials of persuasion, and, therefore, of eloquence.

The next qualities of eloquence are a skilful arrangement of ideas, and a ready use of impressive language. But the student of eloquence, in his first outset, ought not to wait even for these accomplishments; he ought to pour out his thoughts courageously as they rise, taking the first words that occur to him; for good sense, and animated delivery, will compensate for defects in language; but the finest language will not compensate for want of sense and animation.

The next qualities of eloquence, are grace of delivery, and fit modulation of voice to the point in utterance. And in those four points lie the sum total of eloquence. The two first are absolute, and indispensable to every one who would study public speaking. The two last, though not absolute, are indispensable to the man who aspires to the fame of a great orator.

POETRY.

Poetry is the most excellent ideas the human mind can conceive on the subject it treats of, expressed in the most excellent words of the language it is composed in.

Speaking generally, this definition of poetry applies equally to all the varied species of it, from the most sublime strain to the simplest sonnet. Yet poetry is not defined by this definition: because the most excellent words in any language fall short of giving all the conceptions of poetry full expression. In the true poet's mind ideas rise with a brilliancy and strength that he cannot find words to express: and, labouring with this difficulty, he calls in metaphor to his aid, lays all nature under contribution to find him hieroglyphics to utter his conceptions by, yet often finds his ideas sunk, only half expressed. Poetry, indeed, yields to the student's eye such glimpses into a state of things superior to all that is at present visible to human sense, that conjecture might even venture to imagine it a mode of communication reserved for spirits in a higher state.

It is, indeed, only poetically disposed minds that can fully see the beauties of, and enjoy poetry, as well as truly judge of its merits: because, to such minds, the half uttered flame of the author's mind communicates its sparks, and they can see his ideas, though, like him, they cannot express them; whereas to minds of common construction, its greatest excellencies are generally a dead letter. Poetry passes over them as fire does over asbestos, without making any impression.

Hence it is that poetry has met with such general neglect from mankind, and poets have been proverbially poor. Yet the profession is high, and though denied of just regard by his contemporaries, to the poet of true merit immortality is secure.

DUKE OF SUSSEX'S LIBRARY.

Another portion of this valuable collection has been brought to the hammer; the really useful publications, as usual, passed off at trifling prices; what were denominated curiosities of literature went at equally astonishingly high prices.

ANTIQUARIAN RESEARCHES.

The learned Societies devoted to the cultivation of a knowledge of antiquities, seem suddenly to have acquired a temper not at all in unison with the gravity and tranquillity of their pursuits. The Antiquarian, one of the oldest and most esteemed of our chartered scientific bodies, seems in strange commotion, demanding that its president shall annually entertain the members with an address—its auditors explain its finances—the librarian's salary be charged—his fees abolished; that discussion be encouraged, and the council a little more attentive to its duties; whilst, in the Archæological, a dissension has arisen, which threatened its complete annihilation. We, however, are happy to find, from a verbatim report of the proceedings at a general meeting, presided over by the treasurer, Mr. Pettigrew, that a re-establishment of the association, on sound principles, will take place.

PORCELAIN PAINTING.

Mrs. M'Ian has given a report to the Council of the Government School of Design, of a journey undertaken by her to Paris, and to the Staffordshire Potteries, during which she inspected the processes of porcelain painting at the different manufactories; the result of her comparison of the artists of the two countries is by no means unfavourable to English ability.

At Messrs. Copeland's manufactory, in Staffordshire, more especially, she saw specimens of flower painting in porcelain, equal to the best productions at Sèvres, where that branch is most admirably executed. This, she remarks, implies, in the English artist, a much greater degree of merit, because he has been wholly unassisted; development of talent being left to individual energy and perseverance; whilst in France he has had the advantage of systematic and special training for the employment, and the emulating patronage of a royal manufactory, munificently supported by the government.

The colours used by the French, she observes, are superior to those of the English: for flesh tints, they have reds and yellows, that will mix and burn together, which, with the colours used in our potteries, is chemically impossible; the media made use of by the French are also superior. In neither country is there any attempt at originality in design, the artistical labour consisting in a continual process of copying. Mrs. M'Ian thinks that if, in the Female School at Somerset House, a class was formed for studying the art of painting porcelain in a superior manner, the more skilful pupils would find employment at their own homes, as the manufacturers would be happy to transmit to them work for execution.

PARAGUAY.

This interesting country, which has been so long a sealed book, has been visited since the death of Francia by two or three enterprising Europeans, who describe the population as extremely timid with regard to foreigners, and exceedingly simple in their habits and manners. A letter which we have seen states that, on a stranger presenting himself at the frontiers, numerous interrogations are made as to his occupation, religion, and opinions. He is expressly told that he must neither speak of the form of his own government, nor make any remarks upon that which he finds established, and that if he indulge in any conversation that can be considered political, he will be sent out of the country under an escort of Indians. One of the singular circumstances attendant upon the dictator's death, has been the marriage of a large portion of the population previously living together on very equivocal terms. During his life no one was permitted to marry without his special permission, which was not very easily obtained. Fathers, mothers, sons, daughters, grandsons, granddaughters, nay even the fourth generation, as the female is marriageable at the age of twelve, have availed themselves on the same day of the benediction of the priest, and the holy bonds of wedlock have been entered into by whole villages. The society at Assumption is described as singular, in consequence of the severity with which ladies were treated who decked themselves with much finery. Their dress is formed of one single large vestment, with a belt round the waist. At the tertullas, after dancing, as the houses are scarcely furnished, it is usual for the lady to seat herself on her partner's knee: but no inference is to be drawn from this that the morals are more lax than in other countries; custom and habit reconcile us to strange circumstances. Rosas, whose noble qualities of mind have gained for him the admiration and veneration of so large a portion of South America, appears willing to facilitate the communication between Buenos Ayres and Paraguay.

LADY STEPNEY.

The death of this lady is a loss to a circle of literary friends who estimated her kindness of heart and gentleness of manner; her works are not likely to maintain any long share of public recollection.

Sir Augustus Calcott's water colour drawings are to be sold at Christie's during the ensuing month; his pictures and oil sketches are to be disposed of by private contract.

The library of Professor Thiebout, of Heidelderg, which was purchased by the government of Baden, contains the largest collection of musical works ever brought together; a catalogue is in preparation.

DR. WOLFF.

The arrival of Dr. Wolff after his fruitless journey is a subject of some congratulation to the public; there is, however, little doubt that his fears exaggerated the position in which he was placed. No one would at any rate deny him great enthusiasm in whatever cause he undertakes. A public meeting, it is said, will be held to welcome him.

COLLEGE OF CHEMISTRY.

There is every reason to believe that this undertaking, as it is highly patronized, will be carried out. It is to be regretted that the schools already existing are not considered sufficient for the supply of accomplished chemists.

RAILWAY UNDER THE THAMES.

The plan for forming a railway through the tunnel, proposed by the late Mr. Samuda, has been submitted to the proprietors. The expense will not exceed ten thousand pounds.

THE NEW HOUSES OF PARLIAMENT.

In the year 1847, the New Houses of Parliament will be completed. Owing to the unsettled state of the iron trade, some delay has occurred in fixing the iron work of the roof, but a considerable portion is in readiness The House of Lords is roofed in.

SHIP MANŒUVRES.

Mr. Foulerton has adopted a motive power to act on the Archimedean screw principle, the motive power to be applied from the capstan. Experiments will be tried on some vessels during the spring, to see if by this power vessels of the line will be enabled, when becalmed, to turn, if attacked by steamers. During the attack of Copenhagen, when the gun-boats proved extremely annoying, sloops were fitted with sweeps to resist the attack of even the slight vessel, but the motion produced was too slow to be of any effective assistance. A plan was noticed a few months back, the motive power being the gases disengaged by the slow combustion of gunpowder under water, by which this object could have apparently been attained; but the present authorities at the Admiralty, though much more liberal than their predecessors, refused it their sanction, not being aware of the probable safety or power to be thus obtained.

SCULPTURE.

During the first week in June, there will be another exhibition of models for statues or groups, in Westminster Hall.

DISCOVERY IN PERU.

Mr. Pickett, at Lima, has written to the National Intelligencer, announcing the discovery of some singular ruins of a necropolis, or cemetery, in one of the provinces of Peru, made by Judge Neets. He found at Ceulap a building of most extraordinary character, which he describes as a wall of hewn stone, 560 feet in width, 3,600 feet in length, and 150 feet high. The edifice being solid in the interior for the whole space contained within 5,366,000 feet of circumference, which it has to the before-mentioned height of 150 feet, is solid and levelled; and upon it there is another wall of 300,000 feet in circumference in this form, 600 in length and 50 in breadth, with the same elevation (150 feet) in the lower wall, and, like it, solid and levelled to the summit. In this elevation, and also that of the lower wall, are a great many habitations or rooms of the same hewn stone, 18 feet long and 15 wide; and in these rooms, as well as between the dividing walls of the great wall, are found neatly constructed ditches, a yard or two-thirds in length, and half a yard broad and deep, in which are found bones of the ancient dead, some naked, and some in cotton shrouds or blankets of very firm texture, though coarse, and all worked with borders of different colours.

BURFORD'S PANORAMA.

The exquisite art, of which Burford is so perfect a master, has received from his hand another specimen of with what fidelity can be represented to us the situation of a Chinese city, the surrounding scenery, and even the manners and customs of its inhabitants. A more beautiful landscape has never been presented by him. It is in every respect an ornament to our exhibitions of this spring, and must attract all those who feel interested in the new world opened to our view. Nankin is a city peculiarly striking, not only from the associations connected with it, but from its position on the banks of one of the noblest rivers in the world. The view given to us represents the interior of the city, and a vast extent of the surrounding country. In the foreground, towards the south, is represented a meeting between Her Britannic Majesty's Plenipotentiary, the commanders-in-chief of the army and navy, and the three Chinese imperial commissioners, the Tartar general, and other natives of rank. Although no such meeting took place precisely on the spot represented, yet, as affording an opportunity of presenting portraits of the principal persons engaged in the negotiations, and, at the same time, a characteristic picture of the costume and customs of this singular people, it has been introduced. Towards the north, a considerable and picturesque suburb is seen, in which stands the nine-storied porcelain pagoda. Beyond the suburb, is the wide canal, crossed by several bridges of curious construction, and enlivened by a number of native craft of various forms. A long line of high wall approaches to within a few hundred feet of the canal, over which the city is seen spread out in its full extent. On the left, the Chinese portion stretches for several miles along the western wall; the low, even ground, presenting long lines of dull, narrow streets, with dense masses of houses thickly crowded together, broken here and there by a triumphal arch, or high flag-staffs with red triangular streamers, and intersected by two considerable canals; every commanding eminence being crowned by a temple, or some large public building. In the distance, beyond the northern angle of the wall, is the Yang-tsze-Keang. On the right is seen the Tartar town, occupying the south-east angle of the city; a portion of which, as well as the boundary wall to the east, is hidden by many pleasing eminences, well covered with plantations of bamboo and underwood. The valley in which the city stands presents on all sides the appearance of a large garden, interspersed with numerous shrubberies. The tamarind tree, the evergreen oak, the cedar, all adorn the picture. The surface in general is slightly undulating, and intersected by exceedingly picturesque and abrupt ridges; whilst, on all sides, the view is bounded by graceful hills and mountains of singular form, tinted with great diversity of colour. Altogether the view, without being particularly grand or bold, has sufficient dignity and extent to command attention, and is fine, pleasing, and interesting. Seldom has there been a panorama so likely to interest the public; and at the same time we strongly recommend those who saw the Panorama of Naples, during the dark days of the winter, to take advantage of the sunshine of the spring. They will be delighted with the apparent improvement of the painting when lighted up by the brilliancy of the sun: it has altogether the effect of enchantment. Those who saw it only during the fogs and clouds of January can form no conception of the actual beauty of the scene.

THE DRAMA.

"TIME WORKS WONDERS."

Douglas Jerrold's new comedy, entitled "Time works Wonders," possesses many of the essentials of sterling dramatic composition — purpose, character, and a great deal of good writing. In plot it is not very original, nor perhaps very skilfully worked out. We have had, particularly in adaptations from the French, very many pieces whose interest turns upon the temporary estrangement of early lovers, resulting in most cases from false pride or groundless pique, and their reconciliation in the end under the potent influence of feelings which they strive in vain to conceal from one another; and in many of such pieces we have seen more of skill, perhaps we should call it trick, leading to a surprise in the dénouement, than Mr. Jerrold has exhibited. He appears, indeed, to have disdained to take up his theme in this manner. On the contrary, he treats it as an important moral question, and works it patiently to a wholesome result, as sufficiently interesting in itself without any adventitious aids. In the hands of the mere playwright the story, so far as the principal characters are concerned, might have been made much more startling—much more amusing; but considering that the persons most interested are a most high-minded, loving, and devoted young girl, with an absolutely broken heart, and her former lover, who, in obedience to the admonitions of his haughty uncle, pretends to forget, assuming an indifference which makes him appear odious to himself, and false, unkind, ungrateful, in the eyes of her whose ill opinion almost crushes him to the earth self-abased: considering all this, which is a natural state of circumstances, and one which often occurs in real life, we think that Mr. Jerrold has done right in treating the subject as a sad and painful lesson, and not as a joke; and that he reaped a higher reward in some tears which we saw shed in many parts of the house, than he would have done had his hero and heroine entertained the audience with the most brilliant repartees and whimsical cross-purposes at one another's expense. And here, before proceeding further, let us bear testimony to the exquisite performance of Miss Fortescue, who made her début at this theatre in the part of *Florentine*. In voice, look, action, it was the perfect impersonation of fresh truthful womanhood; devoted, impassioned, confiding in her love; in her the simple story of the runaway school girl (for such she was in the first act) soon assumed a dignity and importance which subdued the audience from the laughter in which the earlier scenes had thrown them, to gravity, to intense and painful interest; and, finally, when at the earnest admonition of a friend of her family, who overtakes the runaways at the inn, she consents, for the sake of her intended husband's prospects, who it is pointed out to her will be cast adrift by his aristocratic relations, scorned by his friends, and reduced to a life of hopeless ruin and misery by the union;—then upon these considerations, for her love could brave all the slights and persecutions which the patrician family could put upon herself,—she consents to go back to school, without even saying one sad farewell to her lover, who is absent and looking after a change of horses,—consents even to leave his treasured miniature with the landlord to deliver back to him: and is led bewildered from the stage, declaring herself, but in faltering accents, "happy" that she has done her duty. The curtain fell between her and an audience who longed to rush after her to offer the invitation of tears to so excellent a creature, so early doomed to wretchedness, and whose life henceforward was to be a dreary blank.

Five years elapsed between the first and second acts. *Clarence Norman*, (Mr. Holl,) the lover, who has been travelling abroad, returns to his uncle's house; having forgotten, or fancied he has succeeded in forgetting, his pretty but plebeian love of early age! He can even laugh at the idea of her probable present occupation of "serving out hot rolls at eight in the morning,"—for *Florentine* in sooth is, or was, "a baker's daughter!"

Florentine's father is dead,—she has come into considerable property, and after travelling on the continent herself, is living in elegant retirement at her own house, which happens to be near that of *Sir Gilbert Norman* (Mr. Stewart). In the course of her rambles with her drawing book, the proud baronet comes across her steps, little imagining who she is,—falls desperately in love with her, (his first love, though five and forty years of age,) and proposes marriage. She, cut to the heart at the assumed coldness of *Clarence*, on his first visit of politeness, followed up by the announcement that in obedience to his uncle's desire he is about to marry a lady of high connexions; and her womanly pride, hurt on hearing of the facetious and unfeeling allusions which he has made elsewhere to her humble origin, and the folly of their former attachment,—at first, out of a mere spirit of revenge, accepts the baronet's hand. Of this honour she speedily repents, and in their next interview candidly tells *Sir Gilbert* that she cannot love him, and in her turn intreats him to absolve her from her promise. *Sir Gilbert*, though a proud man of the world, is yet a gentleman and a man of honour; passionately as he loves her, he is not selfish enough to sacrifice her happiness to his:—"Rise, madam, I absolve you," he says, "I came to seek a wife, and not a victim!" Intermediately, however, a scene of considerable power takes place between *Sir Norman* and his nephew; the latter having heard of the intended match, and also having subsequently had reason to guess the real state of the feelings of the unhappy *Florentine*. He rebukes his uncle for his inconsistency in rushing headlong into matrimony with a stranger, regardless of all inquiry as to her family, whilst in his (*Clarence's*) case he had broken up a young and strong attachment upon those very grounds; in impassioned language upbraids him for the misery of which he has been the cause, (withholding the fact, however, as to the identity of *Florentine*,) and plainly asks him now how he thinks he (*Clarence*) ought to act. *Sir Gilbert* cannot deny the force of these remarks, and gives his consent to his marriage with his early love if it will make them both happy. And to his honour be it said, that in the dénouement, after a scene of reconciliation between *Clarence* and *Florentine*, the baronet, though astonished and wounded to the quick at the discovery of who the parties are, honourably abides by his word, and gives his blessing to the now happy lovers. Such is the simple story of this play, which, as far as the main plot is concerned, has not a word to cut out or to alter in it, with the exception perhaps of a scene towards the end, between Mr. Hall and Mr. C. Mathews, in the fourth act, we remember, in which the latter tells a great deal concerning the feelings of *Florentine*, which is already fully known to the audience. There are two under-plots, however, having little or no connexion with the principal plot; one of which, in which Farren, C. Mathews, Madame Vestris, and Mrs. Clifford play with admirable spirit and effect, is so bulky as almost to overlay the main story; and the other of which, chiefly occupied with the absurd flirtations of Strickland and Mrs. Glover, as *Professor Truffles* and *Miss Tucket*, might be altogether omitted without loss of interest. Indeed, Mr. Jerrold's chief fault, in an artistic point of view, appears to consist in a diffuseness both of incident and of dialogue, which fatally mars the unity and effect of his subject. And this was peculiarly and painfully the case in the latter scenes; for here, where the true poet would have hastened to clear away his extraneous materials, in order to concentrate the attention of his audience to his principal theme, he actually revelled in the absurdities of the former, suffering the latter to diminish instead of increasing in bulk and prominence. The consequence was, that the fourth and fifth acts did not support the strong interest of the former three, particularly the first and third; and that the final reconciliation and blessing of the two devoted lovers, in the midst of the broader bustle created by the other characters, had something insipid and unsatisfactory about it. No better evidence of the feeling of the audience as to what was the true intent of the play, could be afforded than by the fact that on every appearance of Miss Fortescue, she was received with a round of applause; a compliment, as we consider, intended not only for herself but for the part in which she so beautifully performed,

The play, however, was received thoughout with the loudest and most unanimous applause from a very crowded house. Indeed, so triumphant was the greeting at the fall of the curtain, that it was drawn up again to exhibit the whole dramatis personæ arranged in the final tableau. A loud and general call was then made for the author, who bowed in general acknowledgment from a stage box, and then a perfect torrent of cries for Miss Fortescue, who, after a considerable delay, was led across the stage by Webster,—tributary bouquets, and bravos, and clapping of hands, and waving of handkerchiefs, forming a sort of triumph.

BRITISH NATIONAL SCULPTURE.

BY THE AUTHOR OF THE POEM OF "THE BATTLE OF LONCARTY," THE COMEDY OF "THE GOLDEN GLOVE," ETC.

There is nothing on which the eye more pleasurably reposes than on those exquisite monuments which from time to time rise before us, to carry down to posterity the just renown of our eminent countrymen; being objects to the erection of which we all contribute, they form a kind of brotherly inheritance that connects the nation as it were into one family. We carry our children and strangers who visit us to view them, as we would to personal domains of our own: we converse of them with a pleasing strife to excel each other in praise of their beauty, and even feel as if we were sharers of the honour they are intended to confer on their great prototypes.

But while these structures aid in immortalizing our heroes, set examples to our rising youth, and delight ourselves, let us not forget, in erecting them, that we are publishing, in volumes of marble, the state of our taste and judgment, the character of our age and time; and as we are at present claiming a high character for taste and refinement, let us take heed that our works may justify to posterity the notions we entertain of ourselves.

To this end we certainly take one judicious step, we are liberal of our money; and none can dispute that there is much to praise and admire in the general execution of our public monuments; but the sun of our taste in the sculptural art has not yet reached its meridian; it is yet labouring amongst the clouds of morning; and without intending to derogate from the particular merits of such of these works as are already accomplished, a few general observations may be fairly made, and a few hints offered, by way of auxiliary guides to our taste in the future erections of these our most noble national ornaments.

But before proceeding to notice the points in which I think our taste in these erections is often defective, there is a general error in our management concerning them which I beg to refer to, and that is in our placing them in too retired and hidden situations. The earthly remains of our eminent men ought to repose in our most hallowed mausoleums, but the monuments erected to emblazon their merits ought to be as public as were their actions; ought to stand either on our public walks and way-sides[a], or in some temple ever open to all, that they might be a constant memorial in the eyes of our youth to awake in their minds desires to imitate their deeds, and to wake in all our minds the noble sensations they are calculated to excite. How different is now the case! Except at the few fixed hours at which Westminster Abbey and St. Paul's Cathedral are open, the monuments of our great men are almost as closely concealed as their bones, and by the general mass of the people almost as much forgotten.

I allow that the sanctity and solemnity of places dedicated to the worship of the Deity is calculated to throw an additional halo of reverence around these works; but it is quite clear that these works, great as they are, make no return for that advantage to such place, and, with all due deference both to ancient and modern custom, there seems a collision of ideas attending the placing them there, which I think might very fitly be discontinued, and all suitable homage rendered to those works by placing them in some temple sacred only to themselves.

But there may be another reason for our monuments being placed in secluded situations, namely, their being constructed of marble, which, if openly exposed, the hand of brute ignorance might mutilate in sport. This is certainly of some weight; but I see no good reason for our being confined to that material in the construction of our monuments; let them be made of brass, or, if brass be too expensive, let them be made out of our mountains of iron, and then they would resist the assaults of the barbarian unhurt, as the sublime Achilles in the Park has done, invulnerable even in his heels, though as many flints have been hurled at him as perhaps were used in the battle of Waterloo. And in this magnificent statue (the beginning, I trust, of a new system of public monuments in this country,) may also be seen the fine effect that would be produced by public monuments, for who can see it (till after custom has blunted surprise) without being roused by unusually expanded feelings? It is a monument that seems to speak; it tells a tale; on looking at it all the Iliad rushes on the mind; we imagine ourselves in the fields of Troy, viewing the terrific hero roused at last to occupy the limited period of his fated life in deeds to perpetuate his fame; and the association of it with the last great deeds of another hero who has been the instrument of conferring blessings on the modern world is strongly impressive.

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[a] I think it necessary to observe here, that a first sketch of this paper was written some time before the erection of the statues of Pitt in Hanover Square, and Canning in Palace Yard, and passed through many hands, without my knowledge, by a gentleman to whom I gave a reading of it, and from whom, after the lapse of months, I found some difficulty to recover it; and if it was not during these peregrinations seen by the artists who erected these statues, it was at least a curious coincidence thatthey should so soon after appear so much in conformity with some of its suggestions, as will be farther seen in the sequel.

In farther reference to the concealed situations of our monuments, consideration is naturally drawn to the apparently original receptacle of them in Westminster Abbey, namely, "Poets' Corner." There is some pleasantry in the situation of our poets in this place. A corner it is, sure enough; it would seem as if our early priesthood, unwilling entirely to exclude them from a retreat, had just suffered them to sidle in within the threshold, but no farther, for fear of contamination. And is it not really piteous to see the pleasing, the lively Ben Johnson's head stuck upon a tablet of scarce three foot square, with his nose almost snapped by a mean looking door every time it opens and shuts? But perhaps it was thought a special favour to let Ben into a church at all, and farther admission was impossible.

Milton, the bard of Paradise! he surely did not lie under the same objection, yet he stands in much the same piteous plight. Milton, yes! this is all that England has done for Milton!

Butler, thou didst not offend against monarchy; thou wast its incalculable benefactor!—yet penury whilst thou livedst, and this niggardly stone, is all thou inheritest from its gratitude.

But I will not ruminate longer in this corner; I would preserve it, and every relic in it, as affording an interesting display of the dawn and growth of our sculptured taste; but I would have new and suitable statues to all our truly great characters erected in a more public situation, in some temple erected to National Genius; and give them, and all other men whom the approbation of time after them should stamp with the fiat of merit, a place in it; and as the state appears at present to have awaked to the propriety of encouraging the fine arts, I trust it will be seen that such a temple would be a more solid foundation to lay out public money upon, than to lay it out in works of mere ornament, still to be fixed in seclusions where they must necessarily be shut up from public sight.

I now proceed more particularly to express an opinion regarding such of our public monuments as are already set up; and have first to say, that our greatest deficiency at the present time seems to lie in the designing or composition of those works; and this is the great and master department of sculpture. To form a beautiful human figure, or indeed any figure, is, mainly speaking, the labour only of the rule, chisel and mallet; but to select and group the figures on a monument, in the fittest positions and attitudes to make them strike the beholder's mind in the liveliest manner with the point of history they are intended to publish, is the special work of that god-like power of the human mind called invention, is the province, not of the mason, but of the poet; and the sculptor can never excel in his art unless he be a poet also.

The delicate beauty and truth to nature in most of our monumental figures is conspicuous; nay, I think it mere superstition to say that, in this department, we are not quite equal to the ancients; but on this point I shall not at present dwell; it is a point of the art in which we have obtained sufficient excellence, if we take care to preserve it; and as it is a minor one, let us less detain ourselves about the minutiæ of it, and push on for improvement in the great department above mentioned, in which we have often shown much deficiency.

I will instance this in taking a glance at some of our finest existing monuments, and first, at that to Nelson, in St. Paul's Cathedral. This monument is a masterpiece of sculptural execution; on whatever individual part of it the eye rests it is delighted; in the figure of the hero, additional size to that of nature is limitedly yet sufficiently given; and the aspect and attitude strongly express that courage, calmness, and intrepidity which all ages will suppose distinguished Nelson. The drapery of the figure is also well chosen and ably executed, and the elevation on which it stands is noble and well conceived; the anchor and cable on which the left hand rests is also finely done; and although this is a point in the design which could never exist in nature, (for the anchoring department of Nelson's ship had but little connexion with the rearing of his glory, and the hand might have been more appropriately placed on one of his quarter deck guns,) I will not pronounce it a fault, for the anchor and cable are hieroglyphics highly suited to the piece, and the poetry of statuary ought not to be too closely confined to historical circumstances more than the poetry of the pen.

The two sailor boys below, looking up to the hero above, is also a fine conception; they are looking up obliquely, as if dazzled by his glory, as at a light too brilliant for their youthful visions, and desire to emulate his deeds seems to sparkle in their countenances. There is an animation in their apparently still wonder, which seems to fill time to come with hope that their country has not yet numbered all its heroes; and, in point of execution, these two figures are, in my opinion, equal to any thing ever done in sculpture.

Thus much praise the beauty of this monument decidedly calls for. I will now notice what I deem its faults; and the most prominent of these is the figure of Britannia directing the attention of the boys to Nelson; this is not merely a superfluous figure, but it lessens the effect which this point of the design would otherwise produce, for the looks and attitudes of the boys speak all that their presence there can speak, and they would speak that more impressively if we were left to suppose they were directed to look at the hero by his fame alone; for it is the innate desire we observe springing up in the minds of youth to admire their great predecessors, that gives us hope they will soar to the imitation of their deeds, and not when we find them requiring the schooling of tutors. It is, therefore, lessening the young sailors to give them any directors to look at the glory of Nelson but the universal fame of his deeds.

The figure of the lion is the next blemish in this monument; that armorial emblem of power or might is commonplace in a work like this; it is very well in our national arms, where general symbols are requisite, but has as little business in this work as its usual companion the unicorn; it is, in truth, a common hackneyed allegorical figure, and it was bad taste in the statuary to put such figures in this rich matter-of-fact work, while more real and splendid historical truth pressed for admission than could be received.

The basso-relievo figures on the column on which the hero stands lie under the same objections. The hieroglyphical expression of such figures is now too obscure; they belong not to the age of Nelson and British naval glory, but to the ages of Greece and Rome, and as we have expelled them from our poetry, so we ought to do from our sculpture. Instead of those figures, had the pillar on which Nelson stands been covered by the captains who fought under him, and assisted in rearing his fame, or by sailors working at their great guns, it would have been in better keeping with the work and therefore in better taste.

I have been thus minute with the above work, because I deem it one of the finest of our national monuments, and chargeable with the fewest faults. I could mention others, such as Lord Collingwood, in the same cathedral, extended on a cock-boat, surrounded by little Cupids and large Neptunes, and General Ponsonby rolling naked beside his horse, in evidence of the defective state of our taste in composition and design; but as it is painful to censure works for which the chisel has done so much, and which cannot be altered, I shall only here beg that the projectors of such works, in time to come, will take heed what they do, because a monument cannot, like a badly written book, go out of print and be forgotten, but must last for ages, to publish the taste of the time that produced it.

Other more general faults in our monuments I now beg to notice, and one of what I deem amongst those is where the hero is represented dying or falling in his wounds. This I conceive to be a defect of judgment in statuary; it is to immortalize his glorious deeds while living that we decree the hero a monument, not for his death; or the common musketeer who dies beside him, and also dies for his country, has an equal claim. It belongs to history to preserve the painful memory of his fall: his monument ought rather to pourtray him in the midst of some of the great acts of his life, than wound our minds by representing him in a situation which, every time we behold it, must inflict on us sensations of pain.

I next object to the state of nudity in which the effigies of some of our great men are exhibited; never let this again be called good taste in our age and climate. The heroes of ancient Greece might, perhaps fitly, be represented so; they are said often to have lived and publicly associated together in that condition, and their climate might allow of it; but to represent a British gentleman in that state, a person who lived at a time when social refinement expressly forbade it, and in a climate which rendered such a state unendurable, is surely a deviation from all fitness and propriety. I know this error has been fallen into in endeavouring to obviate the difficulty that arises from the continual changes in the fashions of our garments, which, to be given in any present mode as the drapery of a statue, might render it faulty, perhaps ridiculous, even in the next succeeding age. But, in answer to this, I beg to observe, that the greater number of our statues are erected to our naval and military commanders; and I maintain that our naval and military uniforms given as drapery to our naval and military commanders is according to true taste, because, in true taste, those uniforms ought never to be altered; they ought as permanently to distinguish the British service, as the habits of the Roman armies did that of Rome. For the drapery of statues to our statesmen, and men of genius, the robes of office, or the academies, is always suitable, but no native of our country ought to be exhibited in a state of nudity.

Another objection I have to some of our monuments is, the diminutive size of the principal figure. The effigy of departed greatness ought always to be colossal; the dull sense of the great mass of mankind requires to be roused by magnifying the object represented; it is therefore a great mistake to adhere to the size of life in the hero of any sculptural work; such as we see it in the statues of Shakspeare, Garrick, General Wolfe, and others, in Westminster Abbey. This is one of the faults I have to find with the statue of the Duke of Kent in Portland Place; it is not, however, the only one, for I must say it excites in my mind sensations far from pleasing, to see the honourably bald head of the royal philanthropist exposed bare alike to the solar beam and the pelting storm. Statues are erected to invite recollections of life, and if we must consent to the Duke remaining in his present lowly situation on a block of humble granite, I do think he ought to be accommodated with a ducal crown or a canopy; but even that is not so decided a fault as the diminutive size of the statue. Nothing could be more just and pointed than Bonaparte's reply to the painter David, when he expressed difficulty, on account of his diminutive size, in representing him sufficiently grand, in the picture of his crossing the Alps, "Make my size proportioned to the magnitude of the action!" cried the hero, "few in after time will seek to measure my bones."

But it would appear that this error in point of size in our statues has been noticed, as it has been remedied in some of our later works, and, amongst others, in that of Dr. Johnson in St. Paul's Cathedral. This is a suitable size for a statue; one almost feels himself terrified into an assent to the truth of that stern censor's etymologies, and the justice of his criticisms, by looking at the size of his arm and the portentous contraction of his huge brows. The William Pitt, over the great gate of Westminster Abbey, is also a fine work; what aspirant to the fame of an orator can look at it without feeling his blood thrill? without finding all he has ever read or heard of Demosthenes and Cicero realized in his sight! what whig enter within the orbit of its incantations without being almost reconciled to the taxes, and converted to toryism?

The next and last that I shall at present notice of what I deem defects of designs amongst our monumental erections, is in those groups where all that is seen of the hero of the piece is a head or medallion on a tablet, and in some only the name. This is, perhaps, intended as a refinement in statuary, but it is a mistaken refinement, and neutralizes all the purposes of such a work. A monument of that description may be a monument to the skill of the marble-cutter, but it can only be a medallion of the principal, and that of a kind the least effective.

I have advanced the above observations in the most cordial spirit of friendship towards all our living practitioners in the sculptural art, and my design in doing so is, as I have said, not with purpose to traduce such works in that art as are already set up, but as hints regarding the construction of others. For statues and temples are the most durable relics of nations; the hand of time, which bruises books and parchments to dust, is often long repelled by the brass or marble column, and I much doubt whether all the poets, orators, and historians of Greece and Rome, great as they were, have done so much to realize to our minds the high magnificence and exquisite tastes of those famous nations as their architecture and sculpture has done. Let us well attend to our labours in the same arts.

A CHAPTER ON EYES.

(Concluded from p. 375.)

If it be so difficult a task to overcome spherical aberration in optical instruments,—if Cartesian lenses, peripheral diaphragms, and all the appanage of compound glasses, are the somewhat recondite means had recourse to in our comparatively imperfect optical instruments,—what are we prepared to expect in that most perfect of all optical contrivances, the eye? Why, we shall find the very same contrivances as have originated in human skill, only elaborated and perfected beyond the power of human means to accomplish. Let us examine the organ in its details. The first coating or investment of the eye, anteriorily, is the cornea. We beg pardon of the anatomist, who will stoutly maintain the existence of another; our description is for the many, and therefore we will term the cornea the first or most anterior coat. This cornea, then, although not generally called so, is in point of fact a lens, composed of a transparent horny substance of great refrangibility. Immediately posterior to the cornea, is a small cavity filled with a liquid termed the aqueous humour, in the midst of which, and crossing it transversely, is a diaphragm called the iris, having an aperture in its middle termed the pupil. Now it needs no great amount of consideration to prove to us, immediately, that the aqueous humour, placed as it is between the posterior aspect of the cornea, and anterior face of the crystalline body, is itself a lens; still less consideration is required to show us the analogy existing between the iris, with its pupil, and the black diaphragm with its central hole in telescopes. How much more beautiful, however, is the contrivance of nature,—how superior beyond comparison to the clumsy instrument of man's ingenuity! The central aperture, or pupil, not only serves the purpose of obviating spherical aberration, by cutting off those rays of light which would otherwise pass through the edges of the crystalline lens, but it is enabled, by means of a beautiful mechanical contrivance, to be more or less dilated, and thus to admit of greater or smaller amounts of light. Every one is aware of the painful sensation experienced on first emerging from a dark room into the glare of day; the eyes ache, the eyelids close involuntarily, and for some seconds all objects are seen dim and indistinct. Just as much difficulty of vision, although less pain, is experienced by the converse circumstances; that is to say, by going from light into comparative darkness. Afterwards, the eyes in some measure accommodate themselves to the difficulties of the case, and enable us to distinguish objects which were previously invisible. Now all this is explicable on considering the structure of the iris and dilatable pupil, which latter, when the light is strong, contracts, and permits but a small amount of it to enter; and when the light, on the other hand, is weak, dilates to a very great extent, in order that every dilated ray may be turned to account. This beautiful mechanism is most markedly visible in those animals which seek their prey in the dusk; for instance, in the cat, which has pupils of an oblong shape, capable of being contracted into a mere line when exposed to the influence of a powerful light.

On looking at the diaphragm of a telescope, which is perforated by a little hole, and which corresponds to the iris in an eye, we observe that it is studiously coloured dark, as is the interior of the telescope; now here, again, the optician has most closely followed nature; the eye is supplied with just such another dark pigment, the use of which is obviously that of interrupting and absorbing all those rays of light which being irregular or defective, from any cause, do not conduce to the formation of a distinct image. A word or two about this term, ray of light, which has been and is now considerably abused. It is usual in optical books, and indeed necessary to a proper explanation of their diagrams, that the action of light, *i. e.* in straight lines, should be indicated by straight lines, which have been termed rays, or *radii;* now if the corpuscular theory of light be true, the term ray, as applied to a succession of particles in a straight line, is intelligible enough; but if the undulatory theory of light be the true one, then the term ray must be considered to express a mere quality of action in straight lines, and nothing more. The term, however, despite of our criticisms, must still be used as a matter of convenience, notwithstanding that to unthinking persons it may convey an idea that is not exactly true.

After all the preparation which light has undergone, by permeating the various optical media in the eye to which allusion has been made, it at length falls on the retina or expanded nervous web; not in an indefinite blaze, but depicting some form in all its proper hues and lineaments of outline. Here our comprehension of the sense of vision ceases; we can recognise the object painted on the retina, it is true, but the subtle mechanism, or rather vitality, by which the sense of vision is aroused, we cannot tell; all this is veiled in most inscrutable mystery! As sound is known to be the result of vibrations in elastic media, and as the undulatory theory of light assumes that this subtle agent is the result of vibrations also, it has been almost taken for granted, by many physiologists, that it is through the meshwork of the retina being thrown into vibrations that the immediate sense of vision results; but every one who looks at the soft and pulpy retina and optic nerve, must be sensible that they, of all tissues, are least likely to be susceptible of vibrations. To this it may be said, that the crude idea of vibrations in a tense string or column of air is not here meant; but then we may say again, very justly, that no other idea of vibration is intelligible. Indeed, here, as in regard to all the other senses, we find that inscrutable darkness hovers over the last link which joins them to the sensorium. We have hitherto considered the eye merely in relation to its power of recognising objects, but it is subservient to many other purposes than this; for instance, the faculty of sight enables us to judge of size, of the quality of solidity, and of distance. Every one knows that a large object, situated at some distance from the eye, will subtend on the retina an angle no larger than a small object placed nearer the eye; such being the natural consequence of some primary optical laws. Nevertheless, a large body at a distance conveys to the sensorium an idea of a corresponding nature, notwithstanding the small angle which it subtends. Now this, although a very useful quality of the eye, is not considered a primary one, but is merely the result of judgment matured by years.

It is difficult to say how even practice enables us to acquire a knowledge of distances. It has been considered referable to the fact of the different amount of convergence and divergence of the optic axes; for the perfect vision of near bodies, it is quite evident that the axes of the eyes converge, and *vice versa*. Possibly an acquired consciousness of this *may* be the means which nature employs to enable us to judge of distances.

Not only have our eyes to judge of distances, but also to accommodate themselves *to* distances. Every one is aware that optical instruments have to be adjusted to distance. Now in the eye, at least the eye of mammalia, how this adjustment is effected is not so clear. Around the eye-balls are found six muscles, of which four are straight and two oblique; now it has been supposed that the straight muscles, by exerting pressure on the eyeball, were capable of increasing its antero-posterior diameter; and, conversely, by relaxing from pressure, were capable of giving rise to an opposite condition. In these assumed changes some physiologists have thought they recognised the provision in question; others, however, maintain that the recti muscles can by no means exercise such action, and and that there must consequently be some other provision. They are more inclined to think that the difference of elongation (if any) effected on the eyeball may be occasioned by the varying pressure of the oblique muscles. Then comes a class of physiologists who, denying the truth of either of these hypotheses, suggest that the lens itself may alter in shape, by a mechanism which they endeavour to indicate; but even their explanation is not very satisfactory; and so we may, if we are honest, simply state the plain fact that we are in total ignorance of the means nature has recourse to for the accomplishment of the end alluded to, so far as regards the eyes of many animals. Nevertheless, in the eyes of birds a simple and beautiful provision is recognisable. Let us consider, first, the necessities of birds in this respect; their rapid flight renders it indispensable that an object situated at ever-varying distances from their eye should be seen with equable clearness; and it would appear from our previous examination of the eyes of a mammal, that in the latter class no remarkable provision to this end exists. In the bird the case is different; we find a specific organ, of beautiful simplicity and efficacy, adapted to render a prey no less distinct when the feathery pursuer darts down upon it with the rapidity of an arrow, than when viewed from a stationary eminence. The provision to which we allude is called the marsupium, or pecten, a little mass of spongy substance, which the anatomists call erectile tissue, and which is situated in the posterior part of the vitreous humour. This little piece of mechanism is usually flaccid, but at the will of the animal, or, more properly speaking, under certain exigencies of the animal not exactly controllable by the will, it can be injected full of blood, in which case the whole mass of vitreous humour must, of course, be expanded, and the lens pressed further forwards. No more simple, and, at the same time, more beautiful arrangement can be imagined.

Although the eyes of mammalia, including ourselves, are in their normal state capable of adapting themselves to distance, yet in some persons there exists a manifest defect in regard to this quality. Who has not watched some aged individual holding a book or newspaper far away in order to render the characters more distinct? It seems strange that so curious a means should be had recourse to in order that perfect vision may result, yet the reason becomes perfectly evident on examination: this defect is presbyopia, or far sight. Again, who has not observed the not uncommon defect of myopia, or near sight? a condition of things which requires for perfect vision that objects shall be held ridiculously close to the eye. These defects may be stated in general to arise from one of two causes: either from an abnormal alteration of shape in the eyeball, or in an alteration of the refractive property of its contained humours. The influence of the first mentioned cause has been certainly overrated; for although in old age the cornea, and, indeed, the eyeball generally, are certainly flatter than usual, and consequently presbyopia must to a certain extent be the result, yet the alteration of shape is frequently less considerable than the amount of the defect would appear to indicate. With regard to *myopia*, the objection is still more valid; for in childhood the eye is generally more convex than at any other period, and yet children are not so frequently found to be near sighted as are persons already advanced in youth, or approaching the middle of life. It appears more reasonable, then, to suppose that both myopia and presbyopia are conditions referable to alteration in the chemical and physical properties of the humours, and to a want of the power of adjustment, rather than to any mechanical alteration in the form of the eye's refracting media.

To whatever cause, however, either near or long sightedness may be owing, the defect can be remedied by proper glasses. Presbyopia requiring convex lenses, and myopia concave ones.

Nothing can better illustrate the potency of lenses in imparting a due amount of refrangibility to the eye, than the optical appliances used after an operation for cataract. This disease is simply an opacity of the crystalline lens or its capsule, in consequence of which defect it is impossible for light to pass through and impinge upon the retina. Now this transparent or crystalline lens is merely put in the eye to cause a proper amount of refraction, so that rays of light may converge at a focus on the retina. We have seen that the amount of refractive property preserved by the lens in various animals differs very much, as indeed does the refractive property of every other transparent portion of the eye. What would be the effect, then, of cutting up and extracting the lens, so that it might no longer be an impediment to the entrance of these rays? or if extraction should be deemed impracticable or inexpedient, what would be the effect of depressing it or thrusting it aside, beyond the axis of vision? These were bold suggestions at first, but they have been very successfully carried out in performing the operation for cataract. After this operation, however, it is evident that the eye operated upon must be very deficient in refractive power; and hence the necessity of supplying this quality by means of lenses, which are found to be all-sufficient.

Closely connected with the property just mentioned is the quality of judging regarding the distance of an object. This, too, is the result of practice, as a very interesting case has proved. A boy, blind from his birth, was operated on and restored to sight by Cheselden. At first every thing appeared to him on the same plane,—he had no idea whatever of distance,—gradually, however, the faculty manifested itself, and he saw like other people.

There has been among physiologists some discussion as to the means we have of judging of solidity of an object, and the result of this discussion seems to be an opinion that this knowledge is acquired by consideration of the different perspective projections under which different sides of a solid are painted on the retina.

Having alluded to a specific peculiarity in the eye of a bird, let us now regard it in a general sense, in order that we may contrast it with the eye of a class of animals living under precisely different conditions,—we allude to fishes. Every one has noticed the bead-like appearance of the interior of a fish's eye, when boiled. This bead-like substance, opaque after the application of heat, is the crystalline lens; and it will be observed to be nearly circular,—very different, then, to the crystalline lens of terrestrial animals. It is a necessary consequence of this optical form, that rays of light passing through it must converge to a much shorter focus than had the lens been flattened. The cornea, too, is flattened, and indeed the whole eye presents anteriorly a very compressed appearance. Now the reason of all this is obvious enough. Water, the medium in which these animals live, is of much greater refractive power than air, so that the difference between its refractive power and that of the aqueous and vitreous humours is but inconsiderable. Hence, Nature has nearly dispensed with the aqueous humour in a fish's eye, merely having supplied enough to suspend the iris. The vitreous humour, indeed, is present, but, for the reason just explained, its potency is very inconsiderable; hence the necessity which exists for an extraordinary development of the crystalline lens. The sphere of vision in a fish being exceedingly circumscribed, there can be no necessity for any provision adapting the eye to various distances, neither do we find such to exist. As light, in permeating so dense a medium as water, must necessarily be impeded, and stifled to a considerable extent, it would seem desirable that the ocular apparatus of fishes should be adapted to admit a large quantity of luminous rays. Accordingly we find a very large pupil in those animals, but it is usually immoveable, no provision having been made for guarding against a painful glare of light. Generally, the pupil of fishes' eyes is round, but in some cases the form is curiously modified: in the rays, for instance, a broad veil hangs before the pupillary opening; and in one case, namely, the *Anableps*, there are two pupils to each eye. As it is very necessary that the transparency of the cornea should not be impaired by dust or dirt, Nature in most animals has provided glands for the secretion of a purifying liquid,—tears, in fact. We, and other mammalia, possess a tear secreting gland in the outer angle of each eye, which constantly emits a supply of moisture that is distributed equally by means of the motion of the eyelids. Birds are still better furnished in this respect, each eye having two glands, one of which secretes the tears, and the other a peculiar fluid of greater viscidity. Birds also have three eyelids to each eye, two of which are very much like our own; but the third, called the nictitating membrane, does not exist in mammalia, although a comparative anatomist will proclaim that he has discovered its rudiments. This nictitating membrane, unlike the other eyelids, stands and acts transversely: it is moreover translucent, and occasionally the animal looks at objects through it, as when, for instance, the eagle looks at the sun. Every provision, then, we see taken in the bird's eye to keep the organ bright and clear, that acuteness of vision, so indispensable to the animal, may not be impaired. Clearly, however, tear secreting glands would have been totally superfluous in fishes, surrounded as those animals are by a fluid which keeps their eyes bright and moist. Accordingly they are absent, for Nature, although ever beneficent, never takes trouble in vain.

In taking a review of the eyes of various animals, and in considering their different powers of adaptation to various exigences, we cannot fail to be struck with the varying amounts of light which are necessary to produce complete vision in different classes of beings. The owl, the cat, and the bat, can see with an amount of light that would constitute all but perfect darkness to a fish,—such is the different structure of their visual organs. Hence arise in the mind involuntary speculations as to the smallest amount of light which may give rise to vision in certain beings, and the undulatory theory of light presents itself to our imagination in all its fascinations. We involuntarily draw comparisons between the phenomena of light and of acoustics; and regarding them both as referable to a series of vibrations, we begin to surmise that our eyes, as well as our ears, may only be adapted to receive certain impressions from contracted portions of a very extended scale. From the arrangement of the eye's refracting media, it is a necessary consequence that all objects are depicted in an inverted position in the retina; hence arose the celebrated proposition, *Why do we see things upright?*—in answer to which, people were long accustomed to say, rather foolishly, *Because we learned to see in infancy!* The fact is, that so long as all things are seen upside down—even our own noses—in short, every possible thing whatever, there evidently can arise no idea of incongruity, and the wonder ceases.

The question has been much agitated too,—Why we see single, having two eyes?—and with results about as profitable as succeeded that celebrated proposition of the Sorbonne—how many angels could stand on the point of a needle! Perhaps the fairest and the most satisfactory way to answer the question about seeing double would be by asking two others: Why do we not feel double, having two hands? or why do we not hear double, having two ears?

We must not, in our little disquisition upon eyes, forget to allude to that disagreeable obliquity of vision, commonly termed a squint. The muscles which surround the eyeball, and regulate its movements, are intended naturally to balance each other's action. Occasionally, however, one becomes paralyzed, is rendered incapable of duly acting, and then the force of the other preponderating, the eyeball has a tendency to be drawn to one side. Well, what is the remedy which naturally suggests itself? Why, simply this:—to separate the opposing muscle, to cut it in half, when immediately the balance of adjustment is effected, and the squinting ceases. It cannot be denied, however, that a frequent consequence of this operation is a disagreeable projection of the globe of the eye, which, although it has ceased to squint, nevertheless obtrudes itself in a very unseemly manner. A perfect eye should of course be capable of recognising any colour; but this is not always the case. The late Dr. Wollaston, for example, was unable to distinguish *violet*, and only became sensible of the imperfection by chance. Individuals differ greatly in their perception of the harmony of colours. How different the choice of persons in regard to agreeable mixtures of various tints! A lady of good taste may venture on an admixture of strong colours in her apparel, and she will take care that one shall be complementory to another, when harmony will be the result; but a lady not possessing this intuitive feeling for colour, will either make a disagreeable admixture, or, if more prudent and sensible of her want of feeling in this respect, will confine herself to neutral tints, which present no gay appearance, but which can prove offensive to no one. Although this harmony of colouring is in a manner intuitive, it is far from being a subject of caprice, being explicable according to the well known rule, that colours to be agreeable should be complementory to each other; that is, taken together they should form white light.

And now, after this very rambling disquisition on eyes, concocted during the smoky glimmering of our midnight lamp, sundry dim and dusky figures begin to hover before our own visual organs. We wipe our spectacles, and trim our lamp, and think awhile what next we shall say. A crowd of topics, optical, anatomical, and vital, rush into our brian, all thrusting themselves forward, and each claiming pre-eminent importance. We hesitate awhile, put on our spectacles again, and begin to write, but our eyes admonish us, that in describing the beauty and usefulness of others, we are somewhat forgetting the interests of our own. The genius of sleep, too, spreads his dusky wing over our paper,—for a moment we combat him, and bid him begone; but now the flame of our lamp shoots up in an almost supernatural way, and leaves nothing but an ascending wreath of smoke,—so despite our ourselves, and all our good intentions, we needs must end.

ON SENSATION IN PLANTS.

The deeper are the inquiries made into the structure of the kingdoms of nature, the more the laws by which organic and inorganic life is carried on are studied, the more are we struck with the singular order that exists in creation, and the more confident do we feel, as fresh links are discovered of the chain, that there is a gradual ascent from the least perfected up to the highest development of the objects with which we are acquainted as existing upon our globe. The physiologist, as he examines the various kinds of matter under the three great groups of the animal, the vegetable, and mineral kingdom, arrives at the conclusion that, although the distance from man down to the lowest of organized beings is immense, the transition is perfected by distinctions almost imperceptible, and that there is "quoddam commune vinculum," which binds all together, throughout the scale of being, in one harmonious economy. The distinctions between animal and vegetable life at first appear so obvious as to demand but little attention. The great minds that have been occupied in arranging and classifying the objects by which we are surrounded, have, however, acknowledged the difficulties that attend a definition of animal and vegetable beings, and have been sorely puzzled to say where the one begins and the other ends. The anatomist, as he examines vegetable structure in its more perfect condition, finds the most extraordinary resemblance to that formation which exists in animal life. He discovers a cellular, and a vascular tissue, dermoid coverings, a circulation of a nutritive fluid, a digestive apparatus, a respiratory system, and, above all, he is astonished at the complicated machinery, so perfect, so admirably adapted for various ends which the reproductive system exhibits. Here, perhaps, exist a more extraordinary series of changes upon which the world at large is dependent than is found in any other of the wondrous phenomena which it is so delightful to have an opportunity of examining. The reproduction of vegetable beings is a contrivance inimitably adapted for the welfare of mankind; it furnishes the fruits of the earth, so that we may in due time enjoy them, at the same time that it keeps up the chain of existence of beings similar to itself. In its mysterious organization, there are certain undoubted resemblances to what occur in the development of the highest orders of animals; and he who understands the apparatus and its functions, sees what similarity exists in conception and evolution between them. He finds that the same laws, the same organs, the same duties are performed, that the economy of generation in vegetables bears the closest analogy to that by which man himself is brought into being. Each step that we take in our investigation confirms the conclusion, that from man down to the weed on the sea-shore, there is a regular gradation, and that the study of the humblest leads to a knowledge of the highest in the scale.

The peculiar care which some plants exhibit for the distribution of their seeds has been advanced as a proof of some innate sensitive energy. We observe the arachis hypogæa, which derives its trivial name from the circumstance that it hides its seeds in the ground; the flowers hanging on long peduncles, trail with the branches upon the ground; as the other parts of the fructification decay, the germ insinuates itself into the earth, and there the pericarp is formed and brought to maturity. Some plants, like the ruinus communis, or castor oil, as if aware that there is not sufficient nutriment for its young immediately within the neighbourhood of the parent tree, cause their seeds to be thrown by an elastic spring to a considerable distance, and the sound of the bursting the integument may be heard at a great distance. The onopordum acanthum has been noticed for its maternal care of its young seeds; when the petals have fallen off, the calyx closes in over them, firmly embracing them, and retaining them until the proper period arrives when they are fit for germination; they are then suffered to drop and find their way into the subparent soil. In most of those plants which have no seed vessels, there seems to be a provision by which the plant converts either its corolla or its calyx into a cradle, in which its young is to be taken care of and watched over until it can be safely deposited in the earth. Botanists have especially pointed to the cyclamen for the singular care with which her seeds are lodged by her in the ground. Scarcely has the anther shed its pollen when the peduncles on which the germs are deposited twist themselves spirally downwards until the seed vessels come into immediate contact with the earth; and those who have attended to the phenomena assert, that they actually penetrate it for the purpose of depositing these future plants. Those who would see collected together a number of most curious facts which illustrate the subject, and who would feel interested in the question, whether volition, irritability, and sensation are present, will find that, amongst our English botanists, Darwin has entered into it with all the enthusiasm which a true love of science begets, nor has the great founder of botanic science, Linnæus, passed unheeded by these wonderful phenomena, which, whilst they excite the most lively curiosity, serve as additional proofs of the wisdom of Him who created all. Amongst others who devoted attention to the probability of sensation in vegetables, and whose little work is written with great and acute powers of reasoning, must be enumerated Dr. Tupper. His essay was but short, but it was a source of scientific enjoyment to those who perused it. He arrives at the conclusion, after a vigorous investigation, that vegetables, like animals, are endued with sensation of such kind and and in such degree as is best adapted for their own existence. With this idea all will be willing to concur who have discussed the matter. The author of "The Sketches of the Physiology of Vegetable Life" has likewise brought together a mass of curious information, gleaned from a variety of sources, and asks the following question, to which no satisfactory answer can be offered: "Will it be too daring to predict that the variety of wonderful phenomena, which hourly present themselves to our view, in the study of vegetable economy, will in a short time be universally ascribed to the same power of volition which we unhesitatingly grant to animals of the most inert nature?"

Amongst the subjects which the vegetable physiologist has already studied, but of which he is yet incapable of offering decisive opinions, is the nature of the nervous and the muscular power with which some of them are endowed. That there are plants which possess the power of motion, has been known to us from the earliest time of observation on their nature and habits, the mimosa sensitiva, with its extraordinary power of collapse, the contraction of the leaves of the glucine, of the cassia, and of several of the papilionaceous class, the faculty of motion of leaves of the hedysarum gyrans, the dionæa muscipulas, the drosera, all exhibit phenomena which prove that they are imbued with the property which induces portions of the system to contract upon the application of stimulus, and which more especially is found to exist in muscular fibre; that, again, many plants seek the light, spread out their leaves to the sun, sleep at particular periods, and exhibit sensation which belongs to the nervous system.

The instinctive economy of vegetables has been asserted by some physiologists, and numerous have been the curious examples which from time to time have been cited; and that they obey certain innate impulses, which teach them to seek the best means for carrying out their existence and for the reproduction of beings similar to themselves. The science of electro-galvanism is likely to throw some light upon the irritability of vegetables, and to show whether any of them actually possess a muscular tissue capable of being acted upon by this stimulus. From the first observations of Galvani to the present moment, although few experiments have been lately tried, it was shewn that galvanism has a striking power of exciting the irritability of muscular fibre, and even after life has ceased, phenomena of the most singular character have been exhibited. The spasms, the convulsions, and the contortions which have followed upon trials of its power have shown how decided is its influence. Whether this action be upon the imperceptible nervous fibrillæ disseminated throughout the tissue has not yet been ascertained, for the effects have been visible wherever muscular fibre has been exposed to its action. The power of electro-galvanism has lately been tried upon the seeds of plants, and its effects are as yet not sufficiently ascertained; but there is reason to believe that this agent will induce germination to take place much more rapidly, and that in agriculture it may be found useful.

It is now several years since vegetable structure was first submitted to the action of the galvanic pile; and when first investigations upon that branch of philosophy were commenced, great expectations were entertained that we should, through such means, arrive at some degree of proof that plants possessed sensation. Amongst others, Wildenow anticipated such a result. Unfortunately the progress of that branch of knowledge was suspended during the long war, and those who had commenced with ardour and zeal experiments which astonished the world laid them aside for subjects of apparently more immediate interest. Amongst those who thus distinguished themselves was Humboldt, but he has not resumed the experiments and the speculations into which he had entered. His observations did not lead to any decisive results, for he was not successful in many of his trials, and that he had occasional reason to believe that some plants were subject to the power of galvanism, if he found others to resist it altogether; and Giulo, of Turin, found somewhat different results upon the same species of plants.

This ingenious philosopher conducted a series of experiments which shewed that several plants were highly susceptible to galvanic influence. Amongst these, especially, were some of those whose irritability had been the theme of general observation. Thus he was able to shew a striking effect upon the mimosa pudica, the sensitiva and the asperata; but no such susceptibility was visible in the hedysarum gyrans. There appeared to him this striking difference between the effect of galvanic action upon animals and upon plants,—that the effect was instantaneous, the contractions immediate, upon animals, and that it was almost consentaneous with the application; whilst in plants it occurred after some time had elapsed, then languidly, and that the fibres appeared as if affected consecutively. We have, however, not sufficient data afforded us by Giulo to enable us to know with what species of animals he drew his comparison with the action he produced on these plants. As far as our limited experiments have yet proceeded, we must confess that we have seen, as yet, little probability of ascertaining the quantity of what is termed muscular fibre, as developed upon the most sensitive leaf; for we have seen little or no susceptibility to galvanic action excepting in the mimosa. As the spring advances, and as our conservatories furnish us with occasion to examine the subject, we shall not lose the opportunity, as it will lead to the solution of questions in which we are all more or less interested; and whatever adds, even triflingly, to the sum of our knowledge, may become useful to some inquirer into the vegetable world. Some of the beautiful fictions of mythology teach us that our forests abound with lovely and accomplished nymphs bound in the hollow of the tree, and that he who frees them from their enchantment becomes gifted with more than mortal endowment, and becomes possessed of the superior being he has enfranchised. From this allegory the inference may be drawn, that each portion of the vegetable world shuts up some secret of science, which, becoming known, gives to its possessor power over his fellow beings, and an intellectual gratification, which is one of the dearest possessions he can enjoy.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

We feel a great pleasure in laying before our readers the report of the British Archæological Association, which fully answers the remarks that have emanated from other quarters:—

"In presenting to the members of the British Archæological Association and the public in general the Journal of the Association, the Central Committee (appointed at a special general meeting held, pursuant to public advertisement, on Wednesday, March 5th, 1845) think it necessary to submit a brief account of the origin and progress of the Association; together with some explanatory remarks in reference to those events which have rendered essential certain alterations in the arrangement of the Association, and led to a classification of its members.

"The Committee would have been happy to have been spared the performance of this task; but the extreme assiduity with which certain members formerly belonging to the central committee place themselves before the public, and assume to themselves the name and title of the British Archæological Association, and the various misstatements industriously put forth, and chiefly *anonymously* published, either in circulars addressed to the members, or in the newspapers and journals, render it an imperative duty on the part of the president, officers, and committee, to submit an accurate account of that which has passed, and of the present condition of the Association.

"The British Archæological Association takes its rise from conversations which took place between Mr. Wright and Mr.

Smith. Those gentlemen mentioned their intentions to Dr. Bromet; and at a meeting held at Mr. Wright's residence, December 5, 1843, it was determined to establish a central board, for the purpose of collecting from correspondents in all parts of the country, information tending to the 'discovery, illustration and conservation of our ancient national monuments.' At this meeting it was agreed to invite the co-operation of Mr. Albert Way, the Director of the Society of Antiquaries, who eagerly entered into the project, and joined the Committee. To this gentleman succeeded Mr. C. Winston, Mr. Stapleton, Mr. Pettigrew, Sir F. Madden, Sir H. Ellis, Mr. Amyot, Mr. Croker, and several others, until the Committee consisted of twenty-two individuals. Thus was it constituted by self-election at the termination of 1844. As it was intended to collect from correspondents all kinds of information that could be obtained relating to antiquities, and to the remains that are now daily being brought to light by the progress of works on railways, and other sources, it was esteemed necesary, as a means of communication with the public, to establish a journal; and, for the proper conducting of this, a Printing Committee was selected, to whom the papers submitted to the ordinary meetings of the Central Committee should be referred, there to be more particularly determined upon, corrected, and amended, as the members might see fit. This Committee was appointed January 21, 1844, and it consisted of Mr. Wright, Mr. Poynter, Rev. J. B. Deane, Dr. Bromet, and Mr. Smith and Mr. Way, the secretaries. These six gentlemen were to divide among themselves the labour of the journal. No distinct editor was appointed, either by the Committee or by the Central Board; but Mr. Way occupied himself principally upon the first number, which, however, was not ready at the time for which it had been announced. This was a serious matter in a work professing to be published periodically; and Mr. Way's health being delicate, it was deemed advisable to have some one who was able and willing to devote time to the matter. The business-habits of Mr. Wright, added to his knowledge of antiquities, and his eminence in literature, pointed him out as the most qualified person in the committee for the task; and he most cheerfully undertook the performance of this laborious duty, and for a whole twelvemonth gratuitously devoted a very considerable portion of his time to the work, and never once intimated to the central board a desire for any recompense for his labours. The Treasurer has stated in his address[a] to the General Meeting of the 5th of March, that the first allusion with regard to any payment for these literary services emanated from himself; and that he felt, as a literary gentleman, whose time was his property, the Association had no right,—having, from the liberality of the members, funds at command,—to take up so large a portion of Mr. Wright's time, without offering to him something as a recognition of, if not a recompense for, his labours. Mr. Wright was at first unwilling to say anything upon the subject; but being further urged, he communicated with Mr. Parker, the publisher of the journal, who acknowledged the propriety of the measure: but it was never brought before the Central Board, and therefore requires no further notice.

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[a] See "A Verbatim Report of the Proceedings," taken in short-hand by T. E. Jones. 8vo. J. R. Smith, Compton Street, Soho, p. 7.

"The business of the Association went on very happily for one year. Up to December 1844, no disturbance of its harmony took place; a vast amount of information had been collected and published; the Central Committee was obliged to hold frequent meetings; communications poured in from all quarters; and many individuals distinguished by their knowledge in science, arts, and letters, solicited to be placed in the list of correspondents. During this time also (in the month of September) a congress of Antiquarians had been held at Canterbury, an experiment in this country made for the first time; and although proceeded with under almost every possible disadvantage, arising from the infancy of the Association, the illness of some of its members, and the fears and scruples of others as to the result, it succeeded beyond the most sanguine expectations of its most ardent supporters. It is but a mere act of justice to say, that the success of this meeting must be attributed to the zeal and assiduity of Lord Albert Conyngham, the President; Mr. Pettigrew, the Treasurer; Mr. Smith, the Secretary; Mr. Wright, who officiated in the absence of Mr. Way; and Mr. T. C. Croker, who assisted these gentlemen in all their arrangements. Without their exertions, the meeting at Canterbury must have been a failure, and the Association would probably have ceased to exist; for there were not wanting journals to ridicule the proceedings, and it must be added that these representations were in no little degree aided by some of those who are now so zealously urging, in opposition to the Association, a meeting at Winchester, but who did not on that occasion hesitate to denounce the congress as one partaking of a *mountebanking* character. The success of the congress seems to have infused a bad spirit among those who either took no part at it, or attempted to discourage the proceedings; but the effect upon the public was of the most satisfactory description, for it created a spirit of inquiry with many who before had been inattentive to these subjects, or did not foresee their importance to the country. A taste for Archæological pursuits was engendered; and Mr. Wright was solicited by an enterprising bookseller to undertake the publication of a work which might be adapted to the drawing-room table, and thus inspire a taste for the study of antiquities on the part of those who had not before engaged in them. This work was to be called 'The Archæological Album;' it was originally intended to have been published, like other albums, in a volume at the commencement of the year, but time would not permit this to be done, and the proprietor determined it should appear in parts, at the interval of two months. The work is in no respect similar to the 'Archæological Journal,' from which it differs in size, colour, shape, appearance, &c. It does not contain one period of matter belonging to the Association, or that has been obtained through it, nor does Mr. Wright attach to his name any connexion whatever with the Association.

"The only way in which Mr. Wright appears as connected with the Association, is in the course of the narrative of the proceedings of the congress at Canterbury, in which he took so able and so conspicuous a part, and which, as a new feature in this country, and the most striking event connected with Archæology during the year, had been very naturally selected as a proper subject to commence such a work. It is, in short, a simple narrative, not a detail of papers—not such a detail as had already appeared in some of the Kentish newspapers, or since published in 'The Antiquarian Year Book,' and in Mr. Dunkin's 'Report of the Transactions and Excursions of the British Archæological Association at their First Congress at Canterbury,' in which may be found many of the papers at full length, and there published with the sanction of some members, who are now warm opponents of Mr. Wright, for the mere publication of his narrative of the Congress at Canterbury. Mr. Wright's publication of the Archæological Album has, so far from having been an injury to the Association, or an encroachment upon its rights, been one calculated to advance its interests, by showing to the public that pleasure and instruction may be combined in meetings of antiquarians in different parts of the country. It appears idle to dwell upon such matters, and it is quite inconceivable that such a publication should have caused disunion in a society expressly established for the promotion of Archæological inquiries; nor would it be believed to be the source of such dissension, unless it had been so distinctly stated, by those who have seceded, as 'the only ostensible point in dispute.' But the mainspring of this dissension has not yet been fairly stated, and it must now be told that it has originated with the publisher of the journal, Mr. Parker of Oxford, to whom the first intelligence of the Album was communicated by Mr. Wright, and who would have been silent on the subject but for the jealousy excited in his breast by its emanating from another publisher. Mr. Parker would himself have been willing to have been the publisher of the Album; but others possessing it, he immediately set about exciting dissension and alarm in some of the members of the Committee, to whom he represented the injury likely to accrue to the Journal of the Association, and the necessity of issuing a declaration to the effect that no other work but the journal was authorized by the

Association. When first mentioned to the Central Committee by Dr. Bromet, it dropped for want of any one to entertain the subject; it was considered improper and indelicate, and no step was taken upon the occasion. But failing in this, Mr. Poynter, at the next meeting, brought the matter forward, and, with the assistance of Dr. Bromet, a resolution to print a declaration on the cover of the next number of the Archæological Journal, stating that it was the only authorized publication by the Committee, was regularly proposed and discussed. The feeling against it, however, was such, that the proposer and seconder withdrew their proposition—and thus the subject was supposed to have terminated; and Mr. Parker was apprised by Mr. Smith, the Secretary, in reply to a communication he had received from Mr. Parker respecting it, that the Central Committee had not entertained the matter. This occurred at the meeting held on December 18, 1844. On the 28th December a meeting of the Printing Committee, at which five out of the six members were present, took place, and—to the surprise of Mr. Smith and Mr. Wright—the subject of the Album was there brought up; and Mr. Way then determined that a declaration against that work should go out; and upon Mr. Smith and Mr. Wright remonstrating against such a proceeding, in open defiance of the opinion of the Central Committee, by whom the Printing Committee was appointed; and notwithstanding the declaration of those gentlemen, that they would no longer consent to act upon such a Committee, Mr. Way replied, '*We are three to two, therefore we have a majority and shall do it.*' The founders of the Association then resigned their places in the Printing Committee. A circular was drawn up, transmitted to Oxford, there printed and issued by Mr. Parker, although he had received intelligence from Mr. Smith that the Central Committee would not entertain the subject; and this circular was absolutely sent forth *in the name of the Central Committee*, to the great astonishment of the members of that Board, who knew of no such intention on the part of the governing body to which they belonged. The effect of this circular was exceedingly injurious, and gave great offence. It was a proceeding contrary to all ordinary practice, and subversive of all government. The Treasurer of the Society protested against the proceeding, and announced his intention to bring the subject before the next meeting of the Central Committee. The President felt warmly on the occasion, and came up to town to preside at the meeting. Mr. Way canvassed certain members to attend, and there was altogether the largest meeting of the Committee that had been held. The only excuse that could be offered on the part of Mr. Way was, that the Printing Committee had issued a former circular, (which was to announce the first appearance of the journal,) in the name of the Central Committee; to do which, however, the Central Committee had given them authority. As, however, such a matter could hardly be expected to occur again, and as the Treasurer and other members had denounced the proceeding, the President, in the hope of restoring harmony, was induced to request that it might be forgotten, and that Mr. Smith and Mr. Wright, in their anxiety for the welfare of the Association which they had indeed originated, would withdraw their resignations and return to the performance of their duties. Those gentlemen kindly yielded to the solicitation of the President, and the Treasurer withdrew his resolution of censure. The business was thus considered at an end; but at the next meeting of the Central Committee Mr. Hawkins moved, and Mr. Barnwell seconded, a proposition which they had brought ready prepared, to the effect,

"'That Mr. Wright having, while acting editor of the 'Archæological Journal,' become the editor also of a rival work, similar in character, and which has been prejudicial to the main objects of the Association in that publication, the Committee are of opinion that Mr. Wright should resign his place on the Editing Sub-Committee.'

"At this meeting, it must be remarked, there were no less than twenty members present, sixteen of whom voted on the occasion. The numbers were—for the resolution, 10; against it, 6. The latter number should properly be considered as 8, as the Treasurer was in the chair, and had expressed himself unfavourable to the motion; and Mr. Wright, who was present, did not vote. The 'great majority' therefore, of which so much had been said in the circulars, amounts only to 2 in 18; but it was a majority obtained in a manner which at once showed that the Committee was no longer one fitted to carry on the real business of the Association. It was brought together by the importunity and canvassing of Mr. Way, and several who attended on this occasion had not, until this business arose, scarcely ever been present at the meetings of the Committee. During 1844, twenty-four meetings of the Central Committee had been held, at which, from the minute-book, it appears that Mr. Hawkins had only attended once during the year, Mr. Manby only once, Mr. Blore only once, nor had Mr. Way attended but once from June 25, 1844, to January 8, 1845; and it must also be observed, that none of those gentlemen assisted at the Canterbury Congress. The insult offered to Mr. Wright by this resolution naturally excited the astonishment of the President, who had considered himself, at the former meeting, to have been a peace-maker, and to have restored concord. His Lordship held the matter to have been finally disposed of. He determined, therefore, to be present at the next Committee, and then to resign his office unless justice should be done to Mr. Wright. An attack of ophthalmia prevented his attendance, but the Treasurer submitted his opinion to the Committee, and entreated the proposer and seconder to withdraw their resolution. This, however, they declined to do, and the Treasurer moved to expunge the offensive record. Upon this Sir R. Westmacott made a personal appeal to Mr. Wright, suggesting, that as he was the source of the disagreement, whether he would not withdraw himself from the Printing Committee and allow the other members to proceed. Mr. Wright immediately withdrew, and the Treasurer presumed that the minute would be expunged. It was expunged, but in the following terms: 'That Mr. Wright having signified his intention to resign his situation on the Editing Committee, the resolution of the last meeting relative to that subject be expunged.' (Moved by Mr. Hawkins and seconded by Mr. Barnwell.) It was easy to foresee that such conduct was ill calculated to restore peace, or to satisfy the President. It spread ill feeling, and it occasioned the resignation of the President. The Treasurer convened a special meeting, the resignation was laid before it, and it was accepted. No compromise would be entertained. The party, for under such a denomination only can it be described, determined upon receiving the resignation, and the Society was thrown into complete disorder. The Treasurer had resolved upon quitting the Committee; Mr. Smith, the Secretary, intended also to retire; Mr. Wright, Mr. Croker, and others, meant to follow their example; in short, all the active members at Canterbury resolved no longer to hold a connexion with a committee in which such gross injustice could be practised towards its most efficient member, and one of the founders of the Association. But, whilst these disputes were going on, many members of the Association—not of the Central Committee—were anxiously interested in the proceedings, and desirous of taking some step to save the Association from destruction. The Treasurer was entreated not to give in his resignation, and was made acquainted with the intention of many to address to him a requisition to call together the members at large to determine upon the propriety of certain changes in the Association, and to guard against future accidents. No sooner was it known that the President had resigned, than numbers flocked to sign requisitions to take into consideration the condition of the Association; and in the course of ten days there were requisitions addressed to the Treasurer from Canterbury, Sandwich, Salisbury, Cheltenham, Ipswich, Leeds, Sunderland, York, and other places, together with a vast number of signatures in the Metropolis, altogether amounting to 162 in number; thus demonstrating the extraordinary interest felt in the existence of the society, and a determination to promote its welfare. The requisitions, and the names affixed to them, have been carefully preserved and deposited among the papers of the Association. They embrace the names of the principal subscribers and correspondents of the Association, and the Treasurer hesitated not a moment to comply with the request, and to summon a Special General Meeting,—giving as public a notice, and as long a notice, as circumstances would permit. As the conduct of the Treasurer has been severely commented upon for the step he thus took for the preservation of the Association, it is necessary to introduce that which he stated at the Special Meeting so convened:—

"'The ground upon which I have ventured to assume to myself this power of obeying the requisitions, presented to me by so many members, has arisen from the dissensions that have existed in the Committee, and from the equality of numbers in which those dissensions originated; and one other point on which I hold my responsibility to be particularly great towards you, is the having received from so many individuals subscriptions for carrying on the purposes of this institution. I have, therefore, not simply as, unfortunately, the senior officer of this institution, after the resignation of the President, but also as your Treasurer, and therefore bound as a faithful steward to render you a faithful account; I have on these grounds felt it my duty to do this. It is not on a light matter that I would have ventured on a step, giving a publicity that, to a certain degree, may, under particular circumstances, even jeopardize the Institution; but when I tell you that the Committee are divided literally half and half, or nearly so,—for it is ten to twelve—and that all these dissensions have been of a character that have led to the resignation of our President, not merely as the head of the Committee, but also as a member of the Society; and that this was the first President of the Society, who indeed entered warmly into its interests on all occasions, from the commencement; who watched over every proceeding, and was acquainted with every resolution that took place; who sacrificed his personal comforts to us at Canterbury, and overcame those strong feelings resulting from domestic affliction, to perform the duties attached to his office; I felt that I should have been wanting in respect to that noble individual, as well as wanting in my duty to you as your Treasurer, if I had not taken the step which I have done.

"'With regard to calling Special General Meetings, most societies are provided with regulations for calling such meetings, under which they feel themselves bound to act under particular circumstances. But it so occurs, from the constitution of this Committee, and the manner in which this Society has been established, that there are no laws at all relating to this subject; that the regulations have only been made as circumstances called for them in the course of the labours of the Committee; and that, no Special General Meetings being anticipated, no measures were in existence to meet such an emergency. This being the case, and there being no rules to follow in regard to calling extraordinary General Meetings, one looks to the custom of other societies; and the custom of other societies, invariably, even where laws exist, is to provide a power on the part of the President to call extraordinary meetings; which are called indeed by the senior Officers of the Institution, on a requisition by a certain number of the subscribers.'

"It is unnecessary to enter further here into the propriety of the conduct of the Treasurer; it is sufficient to say that circumstances had occurred to provoke dissension—members had been most unjustifiably canvassed to carry a particular object, and that this had led to the resignation of the President and the probable retirement of two other officers, which would have left Mr. Way the only remaining officer of the Association. Other members of the Central Committee had also expressed their determination to withdraw, and it was therefore evident that some decisive step must be taken to rescue the Association from destruction; it offered itself in a general assembly of the members, to which all were invited—every one could attend, and there amity might have been restored; but instead of meeting the subject in dispute in an open and generous manner, the members who had thus created the discord satisfied themselves with denouncing the legality of a meeting of a Society which they knew was without laws, and in declaring all its proceedings null and invalid.

"At the Special General Meeting about 150 members attended, the Treasurer detailed all the circumstances connected with the dispute, submitted to the meeting a history of the Association, marking its progress and its prospects, and the following resolutions were adopted.

1. 'That an Annual General Meeting be in future held in London, in the month of March, at which a statement of the progress of the Association shall be submitted by the Central Committee, and an account rendered of the receipts and expenditure; and that at this meeting, the officers and Committee for the year be appointed.
2. 'That the most grateful thanks of this meeting be given to Lord Albert Conyngham, K.C.H., F.S.A., for the zeal and ability he has displayed in the discharge of the duties of President of the Central Committee; and that he be earnestly solicited to return to the Association, and again preside over the Central Committee.
3. 'That the Central Committee shall consist of a President, a Treasurer, two Secretaries, and seventeen other members; and that the following gentlemen constitute the same for the ensuing year, with power to fill up any vacancy that may arise during that period.—Carried; five dissentients.

'President.—The Lord Albert Denison Conyngham, K.C.H., F.S.A.

'Treasurer.—Thomas Joseph Pettigrew, Esq., F.R.S., F.S.A.

'Secretaries.—Thomas Crofton Croker, Esq., F.S.A., M.R.I.A.; Charles Roach Smith, Esq., F.S.A.

'Committee.—Thomas Amyot, Esq., F.R.S., Treasurer S.A.; Sir James Annesley, F.R.S., F.S.A.; The Rev. R. Harris Barham; John Barrow, Esq., F.R.S., F.S.A.; Captain Beaufort, R.N., F.R.S.; Sir William Betham, F.S.A., M.R.I.A., Ulster King at Arms; George Richard Corner, Esq., F.S.A.; Sir Henry Ellis, K.H., F.R.S., Secretary S.A.; Joseph Gwilt, Esq., F.S.A.; The Very Rev. The Dean of Hereford, F.R.S., F.S.A.; T. W. King, Esq., F.S.A.; R. Monckton Milnes, Esq., M.P.; J. Robinson Planché, Esq., F.S.A.; J. Emmerson Tennent, Esq., M.P.; John Green Waller, Esq.; Sir Gardner Wilkinson, M.A., F.R.S.; Thomas Wright, Esq., M.A., F.S.A.

4. 'That the members of the Association be divided into two classes, Associates and Correspondents. That the Associates consist of Subscribers of one guinea or upwards per annum, or of a Life Subscription of Ten Guineas; by which they will be entitled to receive a copy of the Society's Journal, to attend all General Meetings, and to vote at the election of Officers and Committee. That of the Correspondents no contribution be required; that they be entitled to attend all General Meetings, but not to vote at the election of Officers and Committee.

5. 'That the Journal of the Society be printed and published in London, at the expense of the Association, and that the profits arising from the same be devoted to the purposes of the Institution.

6. 'That the best thanks of this Meeting be given to the Treasurer, for the great services he has rendered the Association from its formation, and particularly for his attention to the wishes of a large body of its members, by convening the present General Meeting, which the members confidently hope and trust will tend to the proper establishment and perpetuity of the Institution.'

"With respect to these Resolutions no comment is necessary, but as regards Nos. 3 and 5, which relate to the appointment of the new Central Committee and the publication of the Journal. No. 3 will be seen to embrace the continuance of all the officers, with the exception of Mr. Way, whose place is supplied by Mr. T. C. Croker. In the Committee are some names that have since been withdrawn, the circumstances attending which are necessary to be stated, because they have been unfairly represented by the other party:—Mr. Amyot and Sir H. Ellis being officers of the Society of Antiquaries, think it proper to preserve a neutrality, and have therefore declined being on the Committee; but it must be observed that Sir H. Ellis disapproved the feelings manifested in the Committee, and that Mr. Amyot on every occasion voted against the dissentients. Mr. King's behaviour is best shown by the following extracts from his letters, beyond which the Committee do not desire to make any remark. In a letter to Mr. Smith, dated February 22d, 1845, he says :—'I deeply and sorrowfully regret that such a schism should have arisen in our Archæological Committee as to induce Lord Albert to resign his presidency. I fear this will be the death-blow to it; but I hope yet that some arrangements will be made to save us. I was not in town the other day (19th), only having returned here last night; and I am about to leave again this evening for a few days. I should be glad to sign the *Requisition*, if you will tell me where it is lying, as I would do anything and every thing which would tend to give support to the existence of the Association. I learn that the Central Committee accepted Lord Albert's resignation. What is next to be done?'

"In another letter addressed to Mr. Pettigrew, dated March 3d, 1845, in excuse for not attending the meeting preparatory to the Special General Meeting of the 5th of March, he writes thus :—'I regret to say that my engagements this evening prevent me the opportunity of attending the meeting of the Committee of the Archæological Association appointed for eight o'clock. I only received your kind note this morning; and it would have given me great pleasure to be present.'

"In a letter to Mr. Croker, dated March 7th, he says, 'I regret deeply that I cannot concur in the measures resorted to by a minority of the Committee in the extraordinary step of calling what has been named a "Special General Meeting of the Association.'"

"The Dean of Hereford addressed the following letter to the Treasurer on the 4th of March :—

"'My dear Sir,—I have been extremely concerned to learn that circumstances have led to a discordant feeling in the counsels of the British Archæological Association, the results of which are calculated to produce so much impediment to the attainment of those ends which I, with many others, have looked forward to with so much confidence and delight. Had not professional duty demanded my attention in another direction, and in a case of much importance, I should not have failed to attend the Special General Meeting to-morrow evening, for the purpose of lending my humble but anxious endeavours to co-operate with others in restoring tranquillity and reorganising our valuable staff. I have too vivid a recollection of the happy week we spent together at Canterbury, and too full a conviction of the great good which the Association is calculated to work—nay, has worked, to think that any who has taken umbrage at what may have been unintentionally offensive, as well as those who have so transgressed, will hesitate to offer up ready concessions at the altar of our common weal. I shall anxiously look forward to the report of your proceedings, in which, under other circumstances, I would assuredly have taken a part. It has been often a wish of mine that I could have been at the Committee, during my frequent sojourns in London, had the rules permitted it; and by the bye, should it be practicable, I could work more regularly, when, after next month, the railway being opened to Gloucester, I shall be brought within easier reach.

" 'I remain, my dear Sir, very faithfully yours,

" 'John Merewether.'

" After the receipt of this letter, it cannot be a matter of surprise that the Dean's name should have been placed on the Committee, to give him a title to attend the meetings at which he expresses his anxiety to be present. Although the particulars of the meeting and the circumstance of his election were immediately communicated to him, no letter was received from him until April 9th, when he appears to have gone over to the opposition, and had his name enrolled as an honorary member of their Committee. The ground upon which this is done is scarcely worthy of notice, for it is one founded, not upon the merits of the case, but upon personal regard for Mr. Way, together with an intimation that the General Meeting was held for a different purpose than that which he had anticipated. It is difficult to reconcile this statement with the expressions contained in his letter printed above.

" With regard to the Journal, the Central Committee believe that no member will dispute the propriety of its emanating from the Association, and the necessity of its being subject to no control but that of the Committee. Such was not the case with the Archæological Journal. Mr. Way made a verbal engagement with Mr. Parker of Oxford as to the publication of the Journal: it was to be at Mr. Parker's expense; if loss was occasioned, the publisher was to sustain it; if profits accrued, one-half was to be paid over for the purposes of the Association. Mr. Parker was thus to have a journal edited free of expense, the materials proceeding from the correspondents of the Association, and put forth as conducted under the superintendence of the Central Committee of the British Archæological Association. Such a journal properly conducted could not but succeed,—many other publishers would gladly have engaged upon the same terms. Many circumstances have arisen in the course of this publication which show the impropriety of the publisher's interference; for Mr. Parker, printing it at Oxford, (a great inconvenience,) inserted papers upon his own authority, illustrating them with expensive wood-cuts that may be useful to him in other publications, and without consulting the Printing Committee on the subject. One paper in No. 4, that of the Rev. C. Hartshorne on Rockingham Castle, has been made a most expensive article, and the Society is rendered responsible for it and any errors it may contain, although it never came before them. It will scarcely be credited, but it is true, that that paper was never submitted to the Central Committee, consequently never referred to the Printing Committee, nor did any proof of it undergo the correction of the editor.

"According to Mr. Way's statement, it was originally stipulated with Mr. Parker that the expense of wood-cuts and other illustrations should be limited to 25*l.* *per Number*, or that an extra 5*l.* might on any particular occasion be permitted; but Mr. Parker's accounts show that the wood-cuts and illustrations for the four numbers of the Journal amount to no less a sum than 217*l.* 0*s.* 6*d.* In No. 4 there are 24 wood-cuts inserted without having been previously seen by the Committee. Mr. Way and Mr. Parker arranged together as to the printing and publishing of the Lists of Members, and to those Mr. Parker added the advertisements of his own and other publications, the Committee being charged for the paper, printing, and insertion of these in various magazines, &c., upon which the Committee was not consulted, and the amount charged for no less than 33,500 of these most unnecessary Lists is 207*l.* 6*s.* 3*d.* The objections offered, however, to this item produced from Mr. Parker an offer to reduce the sum by 103*l.* 13*s.* There are several other particulars in regard to these accounts into which the Committee have no desire to enter. From what has been already stated, it will not occasion surprise to learn that, although 2,000 copies of the Journal shall be sold, the Association can reap no profit; on the contrary, they are regarded as having subjected the publisher to a loss. By the adoption of Resolution No. 5, these difficulties are disposed of. The Journal will henceforth be published at the expense of, and subject to the entire control of the Committee, who will hold themselves responsible to the Association for its proper management.

"In making the preceding statement, the Central Committee have been anxious to avoid all unnecessary personal allusion, and they forbear to notice the numerous calumnies that have been issued against their members. They are unworthy of notice, and the Central Committee will still hope that the time may arrive, when those who have seceded will see the propriety of again uniting their forces in the promotion of a great and useful work There is no feeling of rancour and animosity on the part of the Association towards those who have separated from them, but they deeply deplore the efforts which are being made to withdraw individuals from their body by the exercise of personal influence and the circulation of misrepresentations and fabricated statements. The Central Committee have expressed their desire for amity, and have more than once stated their willingness to reconcile all differences. Mr. Pettigrew told Mr. Way and Mr. Hawkins, at a meeting at Lord Albert Conyngham's, that all those with whom he was acting were ready to receive any overtures that might be made, and that to effect reconciliation every means would be urged and promoted. No proposition, however, has been submitted, and the Committee therefore trust that the members of the Association will exert their influence to promote, in every way in their power, the extension of Archæological research, and to aid the original members in their efforts to carry out the true objects of the Association.

VESTIGES OF CREATION[a].

Ambitious man—placed, as Richter says, "in the centre of immensities, in the conflux of eternities,"—has lately displayed his anxiety to mark the progress of his knowledge by *measuring* them in all directions. Girt with the vast oceans of time and space, he has cast forth his sounding lines, he has erected his watch-towers, to span and fathom the abysses that surround him: and, weighing his spherule of a world against the universe, and his span of life against eternity, has exhausted the powers of his arithmetic in endeavours to discover how much less, and how many times shorter, were the sensible than the real, the contents and the containing.

His success has been consistent with the audacity of the attempt. Hitherto, "all that we know, is nothing can be known." The answer which the universe has returned to our painful questionings has been given only in *negatives*. We calculate series of years, whose sum transcends the powers of imagination, to conceive the period of their lapse—but time is longer than they; and myriads of millions of miles—but space is wider than them all! The units of extent and duration which nature places within our reach, aided as our calculations are by the wondrous powers of mathematical analysis, are far too minute to enable us, with any approach to certainty, to complete the measurement even of the phenomena least removed from our ken.

If we reflect upon the astonishing extent to which our instruments *can* penetrate and measure, the sense of the profundity of those abysses to reach which their powers are vain, will be wonderfully increased. For example,—in our calculations of *space*, the condition of our earth as a planet enables us to view the stars from the opposite side of an orbit whose diameter is 186 millions of miles. Yet in calculating our triangles, even with this enormous base, we find only that the angle thereby formed at the fixed stars, while absolutely inappreciable in regard to most of them, is about one second of a degree in the instance of a double star distinguished as *α′ α′* in the constellation of the Centaur. Now as the second of a degree in a circle of 575 yards radius will have a chord of only the tenth of an inch, the distance of the star thus measured will be more than 80,000,000,000,000 miles. Of the stars whose angle (or parallax) is not appreciable, we can say only that they are more distant still. And if we assume, as probability entitles us to do, that the diminished light of the stars arises not from their size, but their remoteness, we must multiply the figures given above some thousands of times before we have reached the *lowest* limit of the distance at which many myriads of telescopic stars are placed in space. And this refers only to the visible firmament; beyond the range of our telescopes, are we to conceive that the universe is blank and unpeopled?

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[a] "*Vestiges of the Natural History of Creation.*" 1 vol. London, John Churchill, 1844.

With regard to *time*, our powers of mensuration are even more limited: having no certain quantity given us to form the basis of our computations of duration, such as the diameter of the earth's orbit constitutes in space; we are therefore compelled to grope our way through the darkness of dead ages, by the uncertain guidance of an estimate of probabilities. Thus, when we ascertain the comparatively minute changes that have passed over the surface of our planet since the commencement of recorded history, we are able to estimate, approximatively, the period that must have elapsed in the accomplishment of the vast and repeated catastrophes which have visited the earth since the deposition of the earliest strata.

Or when we calculate the time that has lapsed without producing any new or strange developments of animal life, (with certain exceptions, very minute in themselves, and occurring among the *lowest* in the scale of animated nature,) we are furnished with an index to the extent of the period wherein could have been born and extinguished the various tribes of animals, so different in form, habit, and constitution, which have successively inherited their portion of the all-nourishing earth.

Here, too, we find only the *lowest limit*, the period than which we know the actual lapse cannot have been less; but how much *greater*, we have no means of learning. It may not be beyond our hope to succeed in calculating, with some approach to accuracy, the duration of the periods during which each successive creation was permitted to exist. But the time involved in the convulsions by which they were overwhelmed, or the birth-throes that built up the materials of the new earth, when again allowed to repose and vivify, or the eras of lifeless chaos that may have intercalated between the destruction and the formation, must remain for ever undiscovered.

Not many years have passed since the inquiries into subjects such as these would have been denounced as irreverent, not to say impious, in their audacity of speculation; and this not, at the time, without reason. In almost every department of research, a period is at one time or other passed through during which the progress is associated with scepticism, and the establishment of science appears to involve the shaking of the foundations of faith. But this is only a transient phenomenon. It is not more certain that the philosophy of Socrates, the astronomy of Galileo, or the geology of Hutton, contradicted and weakened the principles of the religion professed at their respective eras, than that philosophy when its vision becomes clear, and science when its discoveries are developed, have lent and will lend to religion the most efficacious support.

Nor are the effects of such studies upon the minds of their disciples, in the end, less excellent. The consequences of venturing upon speculations of this vast and mysterious character may at first be, sometimes to bewilder, sometimes to dazzle the intellectual vision; a blinded vanity of its own capacity and achievements may by times invade the mind, which may even dare, in the insanity of its pride, to arraign the councils of the Supreme! But these are mists that will ere long become cleared away; and no pride can linger with us after we are once able to lift our thoughts from the difficulties of the search to the awful sublimities of the discovery. While struggling amid the steep intricacies of the upward path, natural enough is it for us to feel elated at the perseverance or skill we exert in forcing our passage, and to triumph without reserve at every conquest over difficulty,—at each chasm that we have overleaped,—at every precipice that we have scaled,—till we reach and pause upon the summit; and then, standing face to face with Infinity, we find all other emotion extinguished in the overwhelming awe which attends the manifestation of Omnipotence.

"In the beginning," is the favourite period for our theory-makers to lay the scene of their ingenious world-dramas. Having then free scope to select the materials of their future earth, and to arrange them in the order proper for obeying the supposed influences that are to organize them into a shapely and habitable sphere, with unlimited time at their command, and a *tabula rasa* for their successive developments of secular phenomena and animal life,—it would be wonderful if they did not succeed in constructing systems almost without number, each of which should be at least coherent and plausible, till the next one arose to overturn it! When the framers condescended to particulars, and endeavoured to reconcile the multiform and often contradictory appearances of nature with the theoretical necessities of their respective systems, the task became one of much greater difficulty. The startling hypotheses to which they had recourse in their anxious attempts at "accounting for" what the evidence of their senses would not let them contradict, — the violent convulsions summoned without stint to explain the existence of every inconvenient anomaly,—will not soon be forgotten. Between Descartes' vortices, and Whiston's comets,—between Neptunians and Vulcanians, between the "Catastrophists" and the "Uniformitarians,"—a din of strife arose, in which the voice of real Science was not seldom drowned, while the combatants who had ranged themselves under her banners fought for victory instead of truth.

The author of the "Vestiges of Creation" is not inclined to waive his privilege to begin with the beginning of things. The universe, in his first chapter, is described as a section of space filled with the attenuated particles of nebulous matter, on which the law of mutual attraction has just begun to act. We close the book with man established in his supremacy, —having replenished the earth and subdued it,—and waiting for some to-be-expected change in the material organization of the globe he inhabits, for the development of new faculties of sense or intellect, which the author looks forward to as about hereafter to convert the existing race of mankind into a very superior sort of animal. The general result of his inquiries we will give as summed up in his own words.

"Thus the whole is complete on one principle. The masses of space are formed by law; law makes them, in due time, theatres of existence for plants and animals; sensation, disposition, intellect, are all in like manner developed and sustained in action by law. It is most interesting to observe into how small a field the whole of the mysteries of nature thus ultimately resolve themselves. The inorganic has one final comprehensive law, GRAVITATION. The organic, the other great department of mundane things, rests in like manner upon one law, and that is, DEVELOPMENT. Nor may even these be, after all, twain, but only branches of one still more comprehensive law, the expression of that unity which man's wit can scarcely separate from Deity itself."

Taking the divisions of the subject as the author has here marked them out, we will speak first of the inorganic bodies, and their governing law, gravitation.

We do not find much in the work that can claim to be entitled intrinsically *new*. The author has joined Laplace's theory of the solar "rings," with the Herschells' hypotheses relative to the nebulæ, and from the union compiles a theory of the planetary system in which the single law of gravitation is assumed to have been the agent in converting a dispersed and unformed congeries of nebulous particles into the spheres of the sun and planets, regular in form, and adapted for the habitation of living beings.

Proceeding into the domain of *geology*, the author has made free use of the labours of Lyell, Murchison, and Agassiz; and in the region of natural history, of Cuvier, Lamarck, and Macleay; displaying throughout that his reading has been large and diversified; while his speculations bear, to our mind, the impress of having been derived more from the study of books than the observation of nature, and are frequently characterized much more by ingenuity than depth. He has, however, concentrated a considerable amount of information in his pages, and has marshalled his facts with much skill; so that his sketch of the system of creation is both lucid and interesting, and fully merits the popularity with which the volume has been favoured.

As this happens to be the first work, of a strictly popular character, wherein we have seen the phenomena of the nebular theory of the system arranged in consecutive order, followed out into their results, and separated from the detail of mathematical calculations which serve to conceal their meaning from the eyes of any save those initiated in the mysteries of analysis, it may not be uninteresting to explain this subject a little more fully. We will therefore endeavour to give our readers a *perspective* view of the phenomena attending the consolidation of our system under the propounded hypothesis, and try how far we can *realize*, as Brother Jonathan would say, the various stages of the progress.

We must begin by imagining a district of space, filled with the constituent materials of the system, extending to a vast distance beyond the existing orbit of Uranus; and in the condition of attenuated or dissipated particles, without mutual action or internal organization,—a mere aggregate of stagnant and lifeless atoms. In this state *attraction* is ordained to commence its action; at first exhibiting itself under its merely mechanical form, as gravitation; but afterwards assuming the more complex aspects of chemical and electrical affinity.

The first effect of the newly created principle would be to impress upon the various particles a motion directed towards the *centre* of the space they occupied—a motion that would prove most rapid in those atoms situated at the exterior of the mass, decreasing in velocity in the interior, and becoming absolutely *null* at the centre itself. As the atoms drew into closer aggregation, the attractive powers would be increased, and as the focus would be constantly acting, the centripetal motion of the atoms would increase in a ratio of double acceleration, not only from the impulses being constantly renewed, but from their being as constantly made more powerful.

Presently, a new set of motions becomes developed. The moving particles act on one another laterally, as well as centrally; their motions are consequently deflected from the straight line leading towards the centre, and their paths become *spirals*. For although there is no *à priori* reason for the motions to become deflected towards one side more than another, that is, for the spirals to turn from west to east, rather than from east to west, or for the position in space of the equator of their resulting orbit to be in any given plane, yet the chances are hardly less than infinity to one of *some* deflection occurring; and of a certain plane in space being selected for the position of the equator. To suppose the contrary, or, in other words, to render possible the continuance of motion in a direct path towards the centre, we must assume that the atomic mass was at the beginning perfectly spherical in form, and homogeneous in constitution: that its particles were absolutely equal in condition and weight, and adjusted with mathematical precision at symmetrical distances from one another. Such an assumption would, to use a simile that has been already employed, require a combination of chances comparable to those that should occasion a million of needles to remain balanced upon their points when thrown loosely upon the ground.

In process of time, the nebula has reached a state wherein it has acquired rotation, with a fixed axis, equator, and poles. It can now no longer retain the spherical form, if it ever possessed such; for though every particle is still drawn towards the centre, yet the polar segments are impelled with greater velocity, since the centrifugal forces arising from rotation counteract in some measure the influence of attraction. In fact, the equatorial particles are compelled to move towards the centre in inclined planes, while those situated in the axis move in direct lines, and the shape assumed in consequence by the nebula becomes a spheroid growing constantly more *oblate*.

The respective motions continue to accelerate, the *rotative* among the rest, the perpetual rush of the polar atoms towards the centre adding fresh impulse to these latter, so that the spirals gradually approach the circular form; and the centrifugal force continually increases, till at length the spheroid has reached a condition which we may term that of "separation." Mr. Ivory has calculated that in any spheroid in revolution, when the rotation has become sufficiently rapid to expand the longest (or equatorial) diameter into a proportion *two and three quarters times greater* than the shortest (or polar) diameter, or more accurately when the former is to the latter as 27,197 to 10,000, then the particles girdling the equator will be in a state of equilibrium between the centripetal and centrifugal forces, and without exhibiting any tendency to approach the centre will continue to circle around it in an orbit of independent revolution. Of course, should the rotation be increased, however slightly, beyond this point, the atoms would cease to move in circular paths; they would be thrown into or bitsof long ellipses, like the majority of the comets, or even in an extreme case be endowed with an *hyperbolic* motion which would disperse them into space.

This latter accident could never occur to our supposed nebula. For its rotation, as we have seen, is produced through the action of its centripetal tendencies, and could not increase after those tendencies had become null. But it might reach, if it could not pass, the required degree of oblateness, and then the equatorial surface-particles would remain poised under the counterbalancing forces impressed upon them; while the interior portions and polar segments continuing to approach the centre, a broad elliptical belt would be severed from the mass and left behind to continue in its separate and equilibrated orbit.

Meantime the nebula continues to obey the same impulses, the polar axis perpetually diminishing in proportion to the diameter of the equator, till another point is reached where the spheroid has acquired the requisite oblateness, when a new belt is separated. And this process continues till, possibly, the approximation of the particles has brought into action a new form of the great law of attraction—that, namely, of *cohesion;* when the remaining particles will be retained in connexion with each other, and finally agglomerated into a central mass of enormous size and density.

The rings, when separated, would ere long become themselves divided. The same confliction of chances that caused the moving particles to be deflected originally from their straight paths, would now sever the belts into distinct masses, and afterwards assemble their constituent atoms into a spherical form around some centre of greater density than the rest. Thus *planets* would be formed; retaining the orbicular revolution of the original belt, and acquiring in addition an individual rotation *in the same direction,* owing to the greater velocity of the particles in the exterior of the separated belt.

While the planetary atoms are thus conglobating, an action of forces, similar to that which formed their primary belts, may throw off one or more subsidiary rings, which in their turn condense into satellites, in the majority of instances; one single or rather *double* specimen remaining in existence when the belt has preserved its coherence, we mean the remarkable appendages to the planet Saturn.

The satellites would also possess a rotation, and in the very same direction with the orbits and rotations of their primaries. It is indeed from the observed and universal coincidence of these rotations and orbits that the theory we are describing derives its chief support. By the calculation of probabilities, it is proved that for six planets and their secondaries, whose revolutions are known to possess a motion uniform in its direction, the chances are four millions of millions to one that the cause of their rotation must have been identical for them all.

Such is the celebrated Laplace hypothesis, which is now the fashionable theory of the universe among astronomers, and is adopted by the author of the "Vestiges" with no apparent misgivings of its truth. Nevertheless, it will not be difficult to discover several points of great perplexity involved in the hypothesis. We do not so much dwell on the enormous extent of the periods that must have elapsed in completing the phenomena, though these are of duration quite bewildering to the mind; for, as Paley says, "the theorists, who have eternity to dispose of, are never sparing of *time*." But there are one or two of the assumed elements of the theory that appear irreconcilable with the results.

First of these is the inconceivable *tenuity* of the primary matter from which the resulting globes are supposed to have been formed. Our own earth and her satellite, for example, must have originated in a belt of particles which had already been undergoing condensation during a period long enough to develope motions of extreme rapidity, and at the time of separation occupied a circular ring of space, whose circumference was nearly 600 millions of miles, its width extending from more than half way towards the orbit of Venus to at least half way towards Mars, and its breadth probably considerably more. Yet the atoms filling so vast a space, when condensed into solid masses, produced only the comparatively inappreciable globes of the earth and moon; which occupy, as seen from the centre of the system, a circular space of not 20 seconds diameter.

But still more difficult is it to reconcile the hypothesis with the shapes so nearly approaching to perfect *sphericity*, in which the bodies of the system have finally settled. Because the assumed conditions of the production of the planets involve of necessity the existence of the nebulous matter in the form of a spheroid of very extensive oblateness, (as we have already explained,) and the separation of the successive belts could only in a slight degree reduce the excess of the equatorial diameter. The surface of the remaining mass would then have possessed a velocity of rotation nearly approaching to that which would give an equilibrium between the centripetal and centrifugal forces; while no new condition was to ensue which could reduce the velocity and render the shape more spherical. Indeed, as the mass became more solid and dense, there would arise a tendency to increase the velocity of rotation. Yet we find the sun existing as a proximate sphere, and the force of attraction, even at his equator, is many times greater than that of the globe we inhabit. A like anomaly exists in the state of our earth and its moon, as well as of all the planets that are attended by satellites.

The supporters of the hypothesis we have described have claimed strong confirmation to their theory from supposed analogies drawn from observations of the celestial nebulæ: and it is true, that the shapes of a few of them, which have been called, "stellar nebulæ," appear to give some grounds to the hypothesis that those singular phenomena are the embryos of systems, composed of matter still unagglomerated, but passing through the preliminary phases of its preparation as the scene of life. But the facts observed are as yet too indefinite to form a trustworthy ground of theorizing, and there are reasons which render it in a high degree improbable that they can form counterparts to the former state of our own system. Their very *visibility* contradicts that supposition. At the epoch when the belt from whence our earth was formed separated from the nebulous mass, the general condition of the congeries of particles must have been that of attenuation in a degree 600 millions of times rarer than the present atmosphere. Matter of such extreme tenuity could never be sufficiently luminous to be visible across the enormous spaces that separate us from the nebulæ.

Even the supposed regularity of form would appear to be somewhat doubtful. As figured by the Herschells, from observations made many years ago, the shape of sundry of the nebulæ was considered to be nearly spherical, with, in some cases, an evident condensation of matter towards the centre. But from Mr. Robinson's account of the observations made with Lord Rosse's magnificent instruments, we gather that their actual form may be found very different; several nebulæ which were described in Herschell's catalogue as regular and elliptic in their outline, being already discovered to be, in Mr. Robinson's words, "irregular," "fringed with appendages," "unsymmetrical," "with a deep bifurcation to the south." This result was to have been expected. The tendency of any inaccuracy in the configuration of the telescope is to produce an image of circular and misty outline. Any one who will punch a hole in a sheet of paper, and then look through it at a distance shorter than the limit of distinct vision, will perceive that the aperture, whatever its real shape, takes a circular form. The result is the same with the circular mirror of a telescope when forced beyond its power of distinct reflection. A picture, equally eloquent and philosophical, of the constitution of the planetary system has recently appeared from the pen of Sir David Brewster. Some speculations upon the mechanical destinies of the system are however introduced at the conclusion, with which, in all humility, we must express our dissent. The writer says, "But while all the phenomena in the heavens indicate a law of progressive creation, in which revolving matter is distributed into suns and planets, there are indications in our own system that a period has been assigned for its duration which sooner or later it must reach. The medium which fills universal space, whether it be a luminiferous ether, or arise from the indefinite expansion of planetary atmospheres, must retard the bodies which move in it, even though it were 360,000 millions of times more rare than atmospheric air; and, with its time of revolution gradually shortening, the satellite must return to its planet, the planet to its sun, and the sun to its primeval nebula. The fate of our system, thus deduced from mechanical laws, must be the fate of all others; motion cannot be perpetuated in a resisting medium, and where there exists disturbing forces there must be primarily derangement and ultimately ruin."

Pace tanti nominis, we would respectfully urge that the deduction relative to this inevitable extinction of planetary motion, through the resistance of the medium in space, appears quite inconsistent with the promised conditions of the original formation of the several revolving bodies. When we assume the system to have sprung from the condensation, and induced motions of the elementary atoms which at one epoch filled the whole space now included in the orbit of the remotest planet, we can only conceive the other that occupies the intervals between them as composed of particles, whose peculiar constitution or high elasticity prevented them from following the example of their companion atoms when these latter coalesced into globes. But though they did not partake of their consolidation, they must have partaken of their motion; and being formed into "belts of separation" at the same times, and under similar circumstances, would retain a motion coincident with that of their contemporary planets, to whose orbicular revolutions they could in consequence oppose no resistance—and their effect, as a medium of resistance, would be exhibited solely in the instances of those stray visitors, the comets, whose orbits are excentric and retrograde as compared with the paths of the naturalized denizens of the system.

The condition of the planetary spheres, at their first formation, was evidently one of excessive heat; approaching, probably, to universal incandescence, or fusion. Geology reveals to us indubitable tokens of the existence of such a temperature; but of its cause we can learn nothing.

The author of the "Vestiges" assumes that it was the consequence of an original state of intense heat in the elementary matter of the nebulæ.

"The earth and all its various substances have at present a certain volume, in consequence of the temperature which actually exists. When, then, we find that its matter and that of the associated planets was at one time diffused throughout the whole space now circumscribed by the orbit of Uranus, we cannot doubt, after what we know of the power of heat, that the nebulous form of matter was attended by the condition of a very high temperature. The nebulous matter of space, previously to the formation of stellar and planetary bodies, must have been a universal fire mist, an idea which we can scarcely comprehend, though the reasons for arriving at it seem irresistible."

This conclusion seems to us to involve a violent assumption by no means authorized by the actual phenomena. Because an intense heat is the only ascertained agent whose influence could now disintegrate the solid mass of the earth, and keep its particles separated even to short distances from one another, it affords no sufficient grounds for the hypothesis that their original state, when they first began to yield to the law of attraction, was a similar condition of incandescence—or, to use his own expression, as a fire mist. Even supposing that the primary particles were kept asunder by the repulsion arising from the agencies of caloric, the terrestrial nebulæ would not have presented the luminous appearance now observed in the celestial nebulæ, and which the writer appears to have contemplated as supporting his argument by analogy. The heat would have been *latent*, appreciable neither to sight nor feeling; just as the heat of steam is no greater than that of the water from whence it is generated, nor is it more luminous, although the quantity of caloric absorbed in converting a given bulk of fluid into vapour is more than sufficient to make it red hot.

Our own opinion inclines to the converse of the hypothesis—that is to say, that the heat which has left such evident traces of its power was the *consequence* of the condensation of particles, and not its escape the *cause*. We know how great is the amount of heat developed when any body suffers compression, and, in fact, quite sufficient caloric can be proved to result from such a process, to account for all the appearances which geologists have attributed to Vulcanian influence.

This theory appears to us to give a better explanation of the many disturbances and irregularities that occurred in the distribution of terrestrial heat during the earlier periods of our planetary existence. Long intervals of quiet and comparative coldness were succeeded by sudden incursions of the fire-element over regions left long to repose. Had the internal heat been a normal condition, instead of a developed phenomenon, the terrestrial atoms must have subsided gradually into a state of equilibrium—each obeying the forces impressed upon it—and it is not easy to imagine, in such a case, the occurrence of any disturbance; the whole mass would have settled down in a fluid or semifluid state, and cooled slowly and regularly into a level sphere.

That the crust of the earth has been subjected generally, and sometimes repeatedly, to the action of intense heat cannot be doubted, any more than the deduction drawn from observations in all parts of the world, that the inferior strata still possess a temperature considerably higher than the average degree at the surface. But the anomalies in the rate of increase appear inconsistent with the idea of a general and central fire. The thermometer is found to rise at very irregular rates when carried into deep mines situate in different places. Kupffer, as quoted by Mr. Lyell, calculated the ratio to be one degree of Fahrenheit for every 37 feet in depth; the mean rate, as estimated from trials in the six deepest mines in Durham and Northumberland, was 1° to every 44 feet; in the lead mines of Saxony the proportion was 1° to every 65; and in the Dolcoath mine in Cornwall, 1380 feet deep, Mr. Fox ascertained the average to be 1° to every 75 feet. Variations so extensive as these are but imperfectly explained by the supposition of some differences existing in the conducting powers of the local strata.

We are now brought to the epoch when the solid mass of this earth had assumed its form; when the conflict and discordance of its elements had subsided into something like repose; and the temperature of the surface become sufficiently cool to allow the existence of animal life.

The detail of all the changes which have supervened, and of the successive appearances of vital forms in the animal and vegetable kingdoms—each new tribe of which possessed organization superior to those of their elder brethren, as the earth grew more fit for the abode of beings of complicated and delicate structure—fills some of the most interesting chapters of the book before us. The various phases of the creative process are described with much graphic power, and the author has traced out the contemporary aspects and phenomena of the natural world with no little ability. We cannot follow him in his march through the long series of life-developments; our space permits us only to revert to one or two of the epochs that occurred. Most interesting among them is that which yields to our investigations the first traces of animal life. The author asks, "And what were those creatures? It might well be with a kind of awe that the uninstructed inquirer would wait for an answer to this question. But nature is simpler than man's wit would make her; and behold, the interrogation only brings before us the unpretending forms of various zoophites and polypes, together with a few single and double-valved shell-fish (molluscs) all of them creatures of the sea. It is rather surprising to find these before any vegetable forms, considering that vegetables appear to us as forming the necessary first link in the chain of nutrition; but it is probable that there were sea-plants, and also some simpler forms of animal life, before this period, although of too slight a substance to leave any fossil trace of their existence."

Coincident with the appearance of these primitive specimens of vitality, is the occurrence of vast strata of limestone, carbonate of lime, a substance hitherto unknown among the rocks. From this concurrence of data, our author inclines to support the theory that the masses of limestone were *produced* by the animals—some of whose remains are found in them—being secreted, as shells and corals are found to be, by the digestive organs of the animals, and changed to their existing stratified form by the action of heat and pressure.

Let us endeavour to give a bird's-eye view of the earth at this interesting period.

An elevated temperature prevailed over the surface; high enough, probably, to obliterate all the influence which the sun could exert, so that the changes of the seasons and the variations of latitude had little or no influence upon the climate. The surface was more nearly level than at later eras; the vast mountain ranges were not yet protruded; an almost universal deposition of sedimentary strata had filled in the chasms of the primitive oceans to a considerable extent. But there was nothing that could be called *dry land*. The atmosphere, probably much more extensive than that now existing, because it contained vast quantities of gaseous particles, since consolidated in various forms, was loaded with dense tepid masses of watery vapour. All the meteorological phenomena were exhibited in phases of enormous violence: the rains were deluges, the gales hurricanes; the electrical fluid was excited into perpetual activity; while the waters of the ocean, heated almost to ebullition, were lashed into mountainous waves by the blasts of the convulsed atmosphere. Yet in the sheltered depths, beyond the reach of winds and waves, in the still waters of the ocean, life might be produced and maintained—such life as that of the scarcely organized molluscs, or that of the "fat weeds" which appear to have existed as their counterpart in the vegetable creation. At this time, all the constituent elements that are susceptible of the gaseous form would be retained in the atmosphere, all the soluble in the ocean. Besides the enormous masses of salt which must have existed, as an ingredient hardly inferior to any other in abundance among the primary constituents of the earth, and which is still in great measure held in solution by the ocean, the basis of the vast calcareous strata was also probably kept dissolved in its uncombined state of lime. Hot water is, it is known, incapable of absorbing carbonic acid gas. The affinity of lime for that acid is also diminished by an increase of heat, while the attraction of carbon for oxygen is enhanced. The whole mass of carbon would therefore exist in combination as carbonic acid, and float in the atmosphere in the state of gas, together with the quantities of aqueous vapour and the existing ingredients now constituting the atmospheric envelope of the earth, and which may be considered as a residuum of uncombined gases.

When the progress of refrigeration allowed the ocean to absorb carbonic acid gas, a rapid formation of carbonate of lime would be the consequence; vast layers of which would successively be formed, and subside to the bottom of the sea. The turbid and caustic waters would thus be purified and rendered fit for the existence of life, every stratum of limestone becoming the *nidus* of various races of animals, adapted to their respective localities, and whose remains are still discoverable.

To suppose, with our author, that the animals could themselves have been the agents in completing the chemical combination of the elements existing in limestone, would oblige us to infer that they differed in every point from the living beings of our own period; as they must have been able to exist in waters impregnated with uncombined lime, a caustic and destructive poison to every known animal.

Some records remain written "on the leaves of the stone book," more astonishing even than the petrified relics of bones and shells, as revealing by their delicate but indubitable traces the occurrence of the natural phenomena of rain and wind, and the daily walks of animals along the margins of the sea beech at those periods of uncalculated antiquity. "Slabs (of sandstone) are found marked, over a great extent of surface, with that peculiar corrugation or wrinkling, which the receding tide leaves upon a sandy beach when the sea is but slightly agitated; and not only are these ripple-marks, as they are called, found on the surfaces, but casts of them are found on the under side of slabs lying above. The phenomena suggest the time when the sand, ultimately formed into these stone slabs was part of the beach of a sea of the carboniginous era; when, left wavy by one tide, it was covered over with a thin layer of fresh sand by the next, and so on, precisely as such circumstances might be expected to take place at the present day. Sandstone surfaces, ripple-marked, are found throughout the subsequent formations. At more than one place in England they further bear impressions of rain drops, which have fallen upon them,—the rain, of course, of the inconceivably remote age in which the sandstones were formed. In the Greensill sandstone, near Shrewsbury, it has even been possible to tell from what direction the shower came which impressed the sandy surface, the rims of the marks being somewhat raised on one side, exactly as might be expected from a slanting shower falling at this day on one of our beaches. . . . . Impressions still more important in the inferences to which they tend have been observed, namely, the footmarks of various animals. In a quarry at Corncockle Muir, in Dumfriesshire, the vestiges of an animal, supposed to have been a tortoise, are distinctly traced up and down the slope, as if the creature had had occasion to pass backwards and forwards in that direction only, possibly in its daily visits to the sea. Some slabs similarly impressed, in the Stourton quarries, in Cheshire, are further marked with a shower of rain, which we know must have fallen *afterwards*, for its little hollows are impressed in the footmarks also, though more slightly than on the rest of the surface, the comparative hardness of a trodden place having apparently prevented so deep an impression being made. Some of the prints indicate small animals, but others denote birds of what would now be an unusually large size. One animal having a foot fifteen inches in length, and stride of from four to six feet, has been appropriately entitled *ornithicknites giganteus*."

It is a curious fact, that the ripple marks and footprints are found to extend through declivities of more than 40 feet perpendicular height; a distance much greater than that covered by the rise of the tides at present. Can this be owing to a subsequent increase of *dip* in the strata of sandstone—or may we consider it another proof of the more violent activity of the natural phenomena during those early periods?

Hitherto we have accompanied our author through his descriptions of inorganic nature, if not with perfect accordance, at any rate with considerable complacency; acknowledging our obligations to him for his interesting pictures of the grand and wonderful phenomena displayed in the process of the formation of our world, and the system to which it belongs. Here, however, our commendations must cease. When he enters on the territory of organized nature, and proceeds to unfold his second law—the law of development—the author falls sadly below the promise which the learning and ingenuity diplayed in his earlier chapters had given.

The theory he embraces is not only false in itself—leading, as it does, towards the rankest materialism—but is enforced with far inferior ability; supported by analogies that are sometimes forced, and at other times laughably childish; and exhibits a crudity of idea, and inaccuracy of reasoning, which our previous experience with him would not have led us to expect. The theory is thus unfolded:—

" What mystery is there here; and how shall I proceed to enunciate the conception which I have ventured to form of what may prove to be its proper solution?.....The whole train of animated beings, from the simplest and oldest up to the highest and most recent, are, then, to be regarded as a series of *advances of the principle of development*, which have depended upon external physical circumstances to which the resulting animals are appropriate....The nucleated vesicle, the fundamental form of all organization, we must regard as the meeting point between the inorganic and the organic—the end of the mineral, and beginning of the vegetable and animal kingdoms, which thence start in different directions, but in perfect parallelism and analogy....We are drawn on to the supposition that the first step in the creation of life upon this planet was a *chemico-electric operation, by which simple germinal vesicles were produced.* This is so much, but what were the next steps?....I suggest, then, as an hypothesis already countenanced by much that is ascertained, and likely to be further sanctioned by much that remains to be known, that the first step was *an advance, under favour of peculiar conditions, from the simplest forms of being to the next more complicated, and this through the medium of the ordinary process of generation?*" (The italics are the author's.)

This theory is prefaced by a copious quotation of instances that show by how nice gradations tribes, and genera, and species of animals merge into one another; the whole forming a chain of unbroken connexion from the lowest to the highest being in the scale of organization. Instead, therefore, of deducing what appears the only legitimate inference—that the Creator has designed these living beings, varying by such firm shades of form and habit—of faculties and appetites—in order that no domain of nature may remain unpeopled, and no store of her ample provision go to waste, the writer assumes that they have grown out of one another; some unknown change of material condition having caused, or rendered possible, their attainment of a higher degree of physical organization.

From this process man is allowed to claim no exemption. He, too, is one of the "series of advances of the principle of development," and owes the superiority of his rank in the scale of animals to the accident of the earth producing more vigorous nourishment, or enjoying a more genial climate, than in the time of his ancestors, the Saurians. What "peculiar condition" of the terrestial surface completed his happy formation—that is, when and how the simial progenitors of man happened to get the intermaxillary bone withdrawn, the *cauda* effaced, the brain enlarged, &c., &c., we must not inquire. It was, no doubt, a singular time. How forlorn the young "human" must have looked in the strange world around him,—and how very much he must have puzzled his monkey-parents!

The stronghold of the theory rests upon the discoveries of the geologists, that the earth has really shown some traces of this successive development of life, in the regular *gradations* of beings through the various formations and depositions of strata: so that, as the writer remarks, "organic life *presses in* wherever there was room or encouragement for it; the forms being always such as suited the circumstances, and in a certain relation to them." But it is strongly antagonistic to the development-theory that all the various forms of life are found contemporaneously. Many species and genera existing in the primitive epochs may indeed have disappeared: but the types remain—from the lowest mollusc to the highest mammal. If the species rose into one another through a natural process of improvement, under improved physical conditions, why were not *all* promoted,—or why are not the instances of promotion still discoverable? It may be said that *time* is necessary—time, of length to which our existence is only a point. This may be true as respects the *completion* of a change: but surely the progress would be visible. If it were possible at any period for a family of apes to originate the race of man, we ought still to find the young tribes of new men issuing from woods haunted by the orang-outang, and seeking dwelling-places more congenial to their improved faculties.

We said that some of the author's analogies were forced and childish. What else can we term his adduction of fancied resemblances in the vegetable tribes to the forms assumed by currents of electricity? *ex. gr.* "In the marks caused by positive electricity, we see the ramifications of a tree, as well as of its individual leaves; those of the negative recall the bulbous or the spreading root, according as they are clumped or divergent. A plant thus appears as a thing formed on the basis of a natural electrical operation—*the brush* realized. We can thus suppose the various forms of plants as immediately the result of a law in electricity variously affecting them, according to their organic character, or respective germinal constituents. In the poplar the brush is usually vertical, and little divergent; the reverse in the beech; in the palm a pencil has proceeded straight up for a certain distance, radiates there, and turns outwards and downwards; and so on!"

But still more curious is the following:—M. Swainson, developing what is known as the Mackay system of zoology, arranged the order of *quadrumanous* animals without leaving room for the inclusion of man,—a being whom he places in the exterior position assigned him by the highest authority, "a little lower than the angels." The author, led by the necessities of his theory, has recast this arrangement, and placed man at the head of the mammalia, among his congeners the Simiæ; and supports this alteration by the analogy of—what does the reader think? the *carrion crow!* because this plumed biped, standing highest among the *aves*, representing all their capacities and habits; the voracity of the vulture, the soaring flight of the hawk; the ground-pecking habits of the scansores, the taste for vegetable food of the parrots, &c., &c.; this "type of types" requires some better animal than an ape to equiponderate it among the quadrumana! Therefore man must take his stand by the side of his brother, the orang-outang, lest the carrion crow should be ashamed of its mammalian counterpart!

When extended into the region of the intellectual qualities and moral government of man, the failure of the theory is still more signal. We have neither space nor inclination to follow the author through his disquisition upon a theme to which his powers, hampered as they are by the stern materialism of his system, are so painfully inadequate. We must conclude with the conclusion whereto his doctrines have finally led him, and a corollary of such chilling and disconsolate destiny for man upon this earth we hope never again to meet. "It is clear from the whole scope of the natural laws, that the individual, as far as the present sphere of being is concerned, is to the Author of nature a consideration of inferior moment. Everywhere we see the arrangements for the species perfect; the individual is left, as it were, to take his chance amidst the *mêlée* of the various laws affecting him. If he be found inferiorly endowed, or ill befalls him, there was at least no partiality against him. The system has the fairness of a lottery, (!) in which every one has the like chance of drawing a prize."

THE PRESENT STATE OF AGRICULTURAL CHEMISTRY.

(Concluded.)

The farmer's adage, that if you put nothing on, you can get nothing off, is so well known in England, that the use of a cheap and effectual manure has always been an object of research; and the fact of their not producing a return has been the sole cause why the country has not been destroyed by a pestilence engendered by the corruption of the various manures used; night soil, putrid fish, have all been tried, and we have heard of severe fevers thus produced, but the trials of such things can be scarcely designated as experimental, as every known law is against them, gases, as the sulphuretted hydrogen, &c., which are injurious to human life, are scarcely less so to those of vegetables—minerals, as lead, &c., are found equally fatal to both; on watering a plant with any poisonous salt in solution, it can be by experiment proved to be thrown off by the roots, and if the experiment is continued, the plant dies—the excrement of one plant, though poison to itself, being sustenance to another of a different class, is the reason why, unless crops are alternated, the land soon becomes barren or overgrown with weeds.

The peculiar action of the manures require, therefore, to be most particularly studied, and that of the nitrate of soda affords a striking example of not being led by a superficial view. A gentleman having to take a farm, where his unfortunate predecessor had nearly ruined himself by using this manure, found that among other things he had become possessed of a large quantity of this nitrate of soda; he consulted with a chemist and it was suggested to him that the experiment of writing the name before referred to proved, that this salt was greatly beneficial in the early stages, but that the premature forcing rendered the plant weakly, whilst it on that account exhausted the soil; for land, therefore, *where this luxuriance would be checked by the feeding of cattle,* that the best effect might be expected. The results proved the correctness of this view; by sparingly applying the nitrate of soda, he was enabled to feed six sheep on the same proportion of land that would before have barely sustained four. This is a point which would appear to have entirely escaped attention; plants as they grow require different manure to carry out the different changes. The nitrate of soda sparingly applied might possibly exert a most beneficial effect upon the wheat, the grass might start forward under its stimulus into vigorous life, but when a first action was over, and the stalk, &c., was to be formed, the same stimulus would be probably useless, then the application of guano or of other manures would be found most beneficial. In many parts of the country it is the practice to lay on the manure in the autumn. We remember asking a farmer the reason for thus applying it at that time, when it could not certainly be of any use till the spring, and his reply may be regarded as illustrative of the extreme ignorance of natural causes of this class; he applied it at that time to give it an opportunity of soaking into the ground, without giving a thought upon the possible result of so long an exposure to rain washing it away; if the object was to improve land by liming, claying, &c., then the autumn would be the most preferable time. The effect of fibrous coverings on land appears worthy too of the most serious attention: Mr. Gurney, the inventor of the Bude Light, who has lately taken to farming, speaks highly of it. On a person of his scientific attainments, not only in chemistry, but in every branch of natural philosophy, every dependence can be placed, and he informs us, that the results of his experiments on grasses are of a most startling character. He parcelled a large field into several portions; on one he tried the guano; on others the nitrate of soda and salt, and on others the fibrous covering. The experiments of the salt, &c., differed, but not in any very important degree, with the experiments published in the Royal Agricultural Journal; but the fibrous covering was by far more successful than any of the expensive manures: he obtained, he informed us, nearly treble the grass grown from the part of the field left untouched, and more than double from that manured with the guano. The effect of this fibrous covering is not easily explained; it might at first appear to result from the decomposition of the wood, but this was not the case, for the same effect was produced by glass. It would be easy to assign as a reason that the radiation from the earth being interfered with, the temperature might not be lowered to the same degree; or as the last season was one of a peculiarly dry character, the heat of the scorching sun might have been prevented; but more extended experiments are required before any satisfactory explanation of this extraordinary result can be given. This Mr. Gurney intends this year to give, and should they coincide with the results now forwarded to us, a most valuable addition will be made to our knowledge. There are other points on which chemistry has opened completely new views, which have not been followed up by the agriculturists; night soil, for example, would be a most valuable manure, if those gases which render its use so objectionable, and, indeed, so deleterious to vegetation, were removed: now this has been most effectually done by Mr. Marsh of Woolwich. When we mention the name of this chemist, we have but to turn to his discovery of the most accurate test for arsenic at present known, to show the implicit reliance that can be placed upon his authority. He discovered that the coal brought from the Portland districts yields a peculiarly rich olefiant gas, unfortunately not in the same quantity as that given off by the Cannel coal; and when more gas was sought to be obtained by increasing the heat, it was found to be so vitiated by the presence of carbonic acid as to be unfit for the purposes of illumination; but the residue in the retort was a charcoal of the same chemical power as the most carefully prepared animal charcoal; by mixing this with night soil the fetid smell is completely removed, and a manure of great fertilizing power obtained. On some wheat crops it was clearly of very great advantage, but as there did not appear to the speculator a sufficient field for patenting this result, the experiments were abandoned: we trust, however, that some steps may be taken to bring such a valuable discovery more prominently before the agricultural societies. There would be, undoubtedly, considerable difficulties in manufacturing a manure to supply to farmers. The conveyance of the night soil would probably, in practice, be an insuperable objection; but if the charcoal was sold to farmers, to themselves mix with night soil, the expense and trouble would be most amply repaid by the increased product; or those whose trade it is to remove the night soil could speculate in it with the certainty of success; the advantage of removing the stench would be, we should think, a sufficient recommendation to them. There has lately been considerable attention paid to the effect of electricity on vegetation: a gentleman at Tring stated, that by various high poles and wires judiciously distributed near the surface of the earth, he could obtain a greatly increased fertility. Now if we submit this theory to the test of those laws which govern electricity, it must be self-evident that this could afford no result: the metallic points would collect the electricity from the atmosphere near them; this they would conduct to the earth, where it would be immediately carried away by the wires and lost: but grass is itself a very excellent conductor, and the experiments, though old, are yet worthy of being reconsidered, as they bear so distinctly upon this question. A large Leyden jar, charged with electricity, can be easily discharged by two blades of grass, without communicating any shock to the person through whom the discharge passes; and the electricity from a body highly charged with it is silently but rapidly carried off when a piece of turf is brought near to it. The only advantage that could be derived from the use of wires, would be to conduct the electricity from the upper strata of the atmosphere; the wires should therefore cease when within a few inches of the grass, and the electricity collected thus poured upon the grass: in the work of Sir Humphrey Davy this point was particularly noticed; he made it the subject of experiment, from which no particular result was determined. Undoubtedly, a stimulus would be thus given to the plant under which it would appear naturally more forward than an ungalvanized plant examined at the same time; the current produced would also kill or at least drive away worms, and an increased produce be shewn; but in the present state of our knowledge of electrical action on vegetation it is premature to risk an opinion; it would appear from the experiments of Sir H. Davy, that to some plants, as geranium, it was extremely deleterious, destroying them in a few hours, even when a weak current was applied; to potatoes, on the other hand, it appeared beneficial, yet the same manure has been observed to be beneficial to both plants: the experiment at Tring is, however, founded so entirely upon mistaken views, that it is impossible they can afford any data; this would appear to be a subject to which the attention of Mr. Faraday could be directed with advantage.

Bones are now being extensively used with the greatest advantage in our turnip fields; they form an extensive article of shipping from America and Russia, and we owe entirely to them the large turnip fields so invaluable for the sustenance of cattle during the winter months; they consist of phosphate of lime and gelatine, and are applied in the form of coarse powder; the decomposition of this would be extremely gradual, and the nourishment afforded to the plant of the most beneficial character; but applied in this manner there appears to be this great inconvenience, the putrefaction of the gelatine breeds worms, and these prey upon the plant. The farmer often points out entire acres destroyed by this curse, and the only remedy appears to be the weather; if that is wet, these are destroyed, but if the autumn is dry, he is without remedy; this effect could be greatly controlled by mixing salt with the bone dust: a farmer who tried this plan, informed us, that while the farms surrounding his suffered most severely, his turnips completely escaped. Few things must be indeed more discouraging to the farmer than to see his crops thus destroyed; in Holland the farmer always meets this evil by the use of urine, the salts contained in this fluid are peculiarly injurious to these noxious insects, but it requires many applications before they can be thoroughly destroyed. In a garden where caterpillars were devouring a most promising bed of cabbages, we saved them by watering them, by means of a watering-pot, with a weak solution of brine and quassia. Bitters appear to be extremely distasteful to those insects, but oils are to them a direct and fatal poison. The effect is indeed most strange; to those who have never witnessed them it would appear incredible. If to take an insect of the most vigorous life, a wasp, on touching him where the thorax is joined to the abdomen with a drop of oil, life becomes immediately extinct, without a struggle being perceptible. We once watched a boy in a grocer's shop in the country killing several hundreds in this manner, some treacle was spilt to entice them, and as each wasp began to feed, a little oil by a feather was dropped on him, and the one feeding next him was not even disturbed by his struggles. Insect life appears to be totally incomprehensible; a hornet will die instantaneously from a drop of oil, but will live several days though the head has been removed; we saw indeed a decapitated one shew signs of vitality after seven days. It might appear the province of Chemistry to devise some remedy which should free the farmer from this source of loss without injury to vegetation. Tobacco water is recommended for the blight, but this, from the high duty, is perhaps not practicable in this country; the use of quassia and salt would appear, however, worthy of a trial.

The practice of packing potatoes in their leaves is also extremely deleterious to the land; the ground is thus necessarily robbed of those salts which are so essential to vegetation. In the wine districts ploughing in the slips alone prevented extensive tracts of country from becoming barren. A very great improvement has lately been proposed in the application of bone dust as a manure; in place of applying the bone powdered, in which form it is liable to great adulteration, the bones roughly broken, after digesting a few days in muriatic or sulphuric acid diluted with four to six parts their weight of water, are strewn upon the land; the action of the acid would be to free the phosphoric acid and expose the gelatine to more rapid decay: the theoretical objection to this would be, that the effect would not be so permanent, and we believe that it is not so, but the evil from the fly, &c., is greatly diminished, and considerably less is required for the same extent of land. Whatever manure is however applied, the growth of the plant must undoubtedly be owing to the carbonic acid of the atmosphere, the soil itself is derived from the debris of solid rocks, and in the first ages plants must have scarcely derived any sustenance from it; the sand in which plants have grown to the weight of several pounds have been noticed not to have in the slightest degree decreased in weight; and an officer engaged in the Chinese expedition was informed that by withholding this gas they prevented the growth of trees. A perfect oak reported to be the growth of twenty years is shewn in the Chinese Exhibition not exceeding a few inches in height. The geological study of the land would also afford some guide for the improvement of land; it would be hopeless to seek on a limestone soil for any advantage from the employment of lime, or from gypsum on a red sand soil; but some soils which give out carbonic acid are found generally extremely fertile. There is a cave in Italy where this gas is generated in such quantities that lights are extinguished a foot or two above the surface, and small animals, as dogs, thrown into the most violent convulsions; nascent carbon is continually generated to unite with the oxygen, and form this gas, and the various manures may perhaps act in this way. Results which almost foil the chemist are produced by the most minute vegetation; carbonic acid is decomposed, the carbon absorbed and the oxygen dispersed into the atmosphere; the chemist and the ploughman equally witness the effects, and are equally unable to follow or explain the results. A minute blade of grass can effect changes which chemical research, assisted by the most powerful galvanic agency, cannot rival.

THE MAGNETO-ELECTRO-TELLURIC BATTERY OF LINARI AND PALMIERI.

THIS new and important discovery in electro-magnetism holds out considerable expectations of giving us a power not hitherto possessed, and which may yet be applied to a variety of useful purposes both in science and art. We consider ourselves called upon to lay a short notice of it before our readers, in the hope that the practical talent of this country may be brought to bear upon it, so as to ascertain what its merits really are, and whether it possesses any great advantage over the other electro-magnetic instruments which have been contrived of late years.

If a thick copper wire, covered with silk, be wound round a piece of wood so as to form a helix, it will give us the elementary form of the new battery, and the electric current is excited in the helix by the magnetism of the earth, while its presence is proved by the common galvanometer. In order to exhibit the experiment, place the coil parallel to the dipping needle; that is to say, find the magnetic meridian with an ordinary compass, place the helix longitudinally in that meridian, and make its extremity dip towards the earth at the same angle as the dipping needle. Connect the two ends of the wire with the galvanometer, and make the helix rotate from south to north, still in the plane of the magnetic meridian, and as the rotation is effected, the galvanometer will show the presence of the electric current.

If the rotation be now made from north to south, the current will be reversed. This is not the only manner in which the helix may be moved so as to excite the current, which is also induced whenever the helix is suddenly moved *into* or *from* any position in which soft iron becomes magnetic. If the helix be wound on a cylinder or soft iron, or on a bundle of iron wires, the current is increased, but care ought to be taken not to apply too much wire on the cylinder, because the outer layers would be too far from the influence of the iron As the interior mass of the iron does not act in generating the current, MM. Palmieri and Linari prefer hollow cylinders or tubes.

In winding the copper wire round the iron tube, it has been found that with the same quantity of wire more effect is produced if one-fifth of the whole length of the tube be left uncovered at the ends. A further effect is also produced by introducing a few cylinders of soft iron into the uncovered extremities. It is also of importance to remember that the coils should be thicker at the middle than at the ends, so as to have a double fusiform shape. The best proportions are, that the diameter of the helix ought to be four times greater in the centre than at the extremities. A helix prepared in the manner stated forms one element in the new electro-magnetic battery. For practical purposes, a piece of gun-barrel, or other similar iron tube, two feet long, is found to answer best; and the covered copper wire is to be wound so as to form a right hand helix of seven superimposed orders of circumvolutions. The largest battery hitherto constructed consists of eight of these elements placed parallel to each other upon a wooden frame, and at a distance of about five inches from each other, but the distance ought to be increased according to the energy of the elements.

The beginning of the wire of the first helix is to be united with the end of the wire of the second; the beginning of the wire of the second with the end of the wire of the third, and so on, in order that the two free extremities of the wire may be at the origin of the first helix and at the termination of the last. The axis of rotation of the frame is at right-angles to the position of the coils. Each of the extremities of wire of the battery is soldered to strong copper wires. One of these wires passes along the axis and communicates with a brass ring upon the axis. The other wire, completely insulated from the first, also passes along the axis and communicates with another brass ring, separated from the first by a disc of wood. These two brass rings constitute the poles of the battery, and may be made to communicate with any of the usual apparatus for breaking contact. The currents of each separate coil are united by this arrangement so as to give the sum of the tensions; but by a very simple modification all the beginnings of the helixes may be united to one pole, and all the terminates to another pole, so as to give the sum of the quantities.

The frame, with its helixes, is to be so placed that they may rotate in the plane of the magnetic meridian as has been already described. For the purpose of communicating motion to the apparatus, the hand may be directly used; or a large and small pulley with an endless rope, or a system of wheelwork may be employed, so as to give great rapidity; this, however, is not necessary to exhibit the electric spark; which appears at once on moving the apparatus, provided the coils be tolerably energetic. The electric shock may be obtained in the usual way, as in Mr. Clarke's machine; and with a battery such as we have described, it is equal to about two dozen pairs of plates. By uniting the elements two and two for tension, and again uniting these couples for quantity, Palmieri has succeeded in making platina wire red hot and soft iron magnetic. The decomposition of water has been effected by this apparatus, and also that of the ioduret of potassium, sulphate of copper, &c.

Palmieri is of opinion that by using three frames of ten elements each, an electric current might be obtained, the proportion of which to that of the battery already described would be as 15 to 4. Lately Palmieri has succeeded in obtaining a spark from the secondary current by making use of one element consisting of five superimposed coils of copper wire two milimetres thick. A curious circumstance is observed by interposing in the circuit of the battery a coil made of a great length of fine wire. The spark and shock are diminished by its resistance; and if an iron cylinder be introduced into the coil, both cease. If, instead of the iron, a spiral of thick wire be introduced, the spark is diminished; and if the cylinder be now reintroduced within the spiral, it is increased more than natural. This new branch of electro-magnetism has excited great interest, and if we are to believe the " Raccolta Scientifica," we may yet see the terrestrial magnetism which guides a ship enable it to plough its way through the waves.

THE ROYAL ACADEMY.

The Exhibition—"the exhibition," par excellence—opened with the month of May, and certainly, say what people will, it comes as a giant both in bulk and quality, as compared with the pigmy compeers who start in the annual race a few weeks earlier. Say what people will, too, of the charms and attractions of water-colour painting, it is after all a very humble vehicle, and fit only for landscape subjects and domestic bits of the more homely class. Something of this kind we have said before, and we now repeat it, though, loath to say, orthodox as we are in our attachment to oil painting, there are many pieces in that line in the present exhibition which provokes us not a little, making us wish they could fade, not into water, but into thin air itself. With these, however, we shall have little or nothing to do in our critical capacity,—we see no use in exposing additionally absurdities which already sufficiently expose themselves to all judicious eyes, and in eliminating profound judgments against delinquencies which, with the close of the year, must be gathered to the walls of congenial tastes, where they must for ever remain harmless.

On entering the great room, we are a little abashed, as usual, at being stared out of countenance by such a mass of well dressed ladies and gentlemen, whose portraits figure on the walls by virtue of the prescriptive right of their painters to the best places. Of this class of works, as we shall not return to them, we may here just point out those which seemed to possess superior merit. Of the President's, Sir M. A. Shee, No. 71, "Portrait of M. Thomas Ralli di Constantinople," is, to our mind, very far the best; it possesses decided character, and we have no doubt is a speaking likeness. Pickersgill's happiest effort is No. 60, "Portrait of Mrs. Crellin," in an easy attitude, dressed with great simplicity in white muslin, with a little pale blue ribbon bow or two, most carefully finished, and, on the whole, one of the best female portraits since the days of Lawrence. No. 206, "Professor Owen, of the College of Surgeons," has considerable character. Sant's "Portrait of Lady Sale" (No. 33) is an interesting picture, conceived and executed in very good taste. Rothwell seems to have considerable practice, and to have acquired proportionate experience in the production of attractive likenesses. He too generally, however, betrays a straining at effect; sometimes, as in No. 512, "Portrait of a

Lady," with a palpable imitating of Lawrence. Linnell shows in all he does a careful hand and a sober judgment, with a happy command of expression and considerable depth and richness in his colouring. One of the most striking portraits in the exhibition is (No. 271) that of Mr. Lopez. Amongst portrait painters we must not omit to make honourable mention of Count D'Orsay, who, in No. 194, gives us anonymously his own bright and handsome features, executed in a style in which a notion of the Titian tone is obvious; and in No. 239, a profile of Lord Lyndhurst, a striking likeness, but executed in a less ambitious style. Looking round the room to the northern wall, the centre of which is usually occupied by royalty, we are dazzled and dumb-founded by Mr. Chalon's huge portrait of Mrs. Thwaites,—sesque pedaliam, at least, in proportions, standing, in conscious pride, in a perfect hall of mirrors, herself a marvel of jewellery, velvets, and lace. Mr. Chalon warns us against pursuing further the contemplations of the genus portraiture, and we shut our eyes for the future upon them without regret.

Landseer contributes only one work, so fanciful and indefinite in its subject, that the artist has sent it to the world without a name. It represents (No. 141) a flock of sheep, lying about in all directions, on an extensive field or plain, and their shepherd performing his devotions, rather theatrically to be sure, before an ancient stone cross. He is attired in a robe of rich purple, which affords a strong contrast to the light, warm tints around. It is a striking picture,—the finish of the various subjects introduced, particularly the woolly coats of the sheep, being as perfect as any thing this artist ever did. But after all, having gazed for some time with curiosity and admiration at these extraordinary achievements of the brush, we shrug the shoulders, and exclaim, "What does it all mean?" to which the catalogue affords no reply. We understand that this picture was bought on the easel by Sir Robert Peel. Close to the above, C. Landseer has two little pieces of still life,—if a great coat in one, and a venison pasty in the other can be so called, which exhibits wonderful manipulative labour, but afford slight mental gratification in return. In another part of the exhibition he has a picture of more pretensions, No. 275, *The Eve of the Battle of Edgehill*, representing Charles the First and his staff taking a homely collation at the door of a cottage, at Radway. There is a good deal of bustling interest in the picture, and some of the faces exhibit considerable expression. But, on the whole, this is a work rather of good promise than achievement.

Eastlake, from whom, as the Secretary of the Fine Arts Commission, so much is looked for in regard to the future prospects of painting in this country, exhibits a truly germanesque ideal of beatification. No. 222, founded upon the concluding lines in Milton's Comus; from its shape it appears to be designed as the study for the embellishment of a panneled arch; and the pale pink and blue in which it is executed are in keeping with decorative rather than high art. The whole composition, both in conception and treatment, is of the tame in the extreme—mere prettinesss being the highest term of praise which could be applied to it. Prettiness, however, is a very humble point for national art to aspire to: indeed, judging by the history of art in Italy, it is not a step towards higher excellence; excess of the said prettiness having rather preceded the downfall, than accompanied the rise of art.

As a specimen of pure historical art on the grand scale, Mr. Eddis's picture, No. 578, "Jochebed, the mother of Moses, attended by Miriam, his sister, about to deposit the babe in the ark," commands attention and respect. Placed by the hanging committee in the outer room of all, it is at first overlooked by the eager visitor, who rushes on headlong to the superior attractions of the Great Room. Upon retracing his steps, however, he will find it worthy of a careful inspection; and though he will find some difficulty in placing himself in a position where the picture is seen in a good light, when he has done so, the quiet and impressive merit of the performance will grow upon him with increasing interest the longer he surveys it. There is a dignity and resignation in the mother, about to be voluntarily bereaved of her darling offspring, and a simple tenderness in the grief of the sister, which partake of the true poetry of art. The colouring is rich and massive, and particularly as regards the distant landscape, and the sky over head perfectly in keeping with the gloom and terror of the occasion.

Mr. Haydon's great picture, No. 605, "Uriel and Satan," challenges criticism by its enormous dimensions, and the cold blue of its capacious sky. When we look at it for a moment, however, we are in doubt whether to be amused or amazed, whether to smile or to frown. Mr. Haydon has here given convincing proof that to follow in the steps of Michael Angelo, and to paint in the grand style, it is not enough to have cut up a whole hecatomb of dead bodies.

Let us pass hastily by Martin's two outrageous visions of Paradise Lost, (Nos. 460 and 610,) and pass back into the Middle Rom, where Danby presents us one of his most glowing canvasses, No. 272, "The Wood Nymph's Hymn to the Rising Sun." As an effort of colouring, this is truly a curiosity. The rays of the rising sun gilding the tips of the hills and trees, and reflecting a cooler edge to the rippling waters, have the effect of enchantment, and make one almost fancy that, like the glow-worm, if inclosed in a dark room this picture would show light of itself. It cannot be denied, however, that dexterity of hand has more to do than poetic sentiment in productions of this kind.

No. 339, "Hannah presenting Samuel to Eli," by R. S. Lander, is a work of considerable aspiring, and, so far as the figures are concerned, evidently the result of laborious study. But there is a stiffness and pedantry in the attitudes which is at variance with the maxim, *ars est celare artem*, and the colouring is pale and jaundiced.

Mr. Herbert's picture, No. 338, "St. Gregory the Great teaching the Roman boys to sing the chant which has received his name," has something of cleverness in it, but with a little approach to caricature in the expression of the singers' faces.

Mr. Claxton has evidently bestowed immense pains upon a rather striking picture, No. 366, "Jews lamenting over the ruins of Jerusalem;" but the attitudes and colouring are both over ambitious, and there is a want of harmony in the general effect.

Near the above is a capital little picture, in Wilkie's early and only true style, No. 360, "The Dame's School," by T. Webster. The idea itself is not a very new one. We have had interiors of schools painted again and again, and all more or less successfully. But it is to the credit of the artist that, coming not upon untrodden ground, he has treated his subject with so much novelty, so much variety, so much skill, that whilst we scrutinize the various groups and faces until we are tired of laughing, we are not able to point out a single feature that he can be charged with having taken from any body else. With a little more *impasto* and transparency of colouring this picture would be perfect.

In the landscape department, the three great masters, Turner, Stanfield, and Roberts, have each several specimens marked with their peculiar genius. Turner, all mystical, undefined, but when seen at the proper distance, transparent and aerial;—Stanfield, clear, sharp, and accurate to a fault in outline, in the sparkling surface of his water and the clear cold tone of his skies;—Roberts, oriental in tone as in the selection of his objects, and with a grandeur and poetry of conception in their general treatment admirably in keeping with the time-hallowed scenes presented. The most remarkable works of Turner are his two pictures of "Whalers," (Nos. 50 and 77,) after description in Beale's Voyage;—of Stanfield, "the Mole of Ancona, with Trajan's Arch," (No. 65,) and "The Action with the Spanish Xebeque Frigate, El Gano, off Barcelona, 6th of May, 1801," (No. 254,) perhaps one of the very best sea pieces painted by this or any other British artist; Roberts has only two subjects, viz. (34,) "Ruins of the Temple of Karnah, by Sunset," and (No. 405) "Jerusalem, from the south east."

The rooms appropriated to drawings, miniatures, and architectural designs, we shall pass quickly through; the specimens being too numerous and too minute to enter upon in detail, and for the most part upon subjects having only a general or local interest. The Sculpture Room, sooth to say, deserves little more extended notice upon any public grounds. A close circle of busts is the principal feature which strikes one on entering the room, and upon more attentive inspection the attempts at ideal grandeur or poetical conception are very few. Mr. Lough's stupendous statue of the Queen, intended for the Royal Exchange, with the sceptre in one hand and the ball in the other, and the heavy cloak gathered under the arm, is the veriest meagre impersonation of the externals of royalty we ever met with in school book or on sign board; it is utterly divested of dignity or individuality of character: in a word a sad failure. The same artist's "Lady Macbeth," in the sleep-walking scene, is a work of much greater merit, evincing considerable genius. Baily has a beautiful subject, gracefully treated, (No. 1327,) "A Nymph preparing for the Bath," which may be considered the gem of the room as regards attempts in the higher walks in art. Bell also has a little work, (No. 1363,) "The Child's Attitude, a statue of a little girl," which has a very natural and pleasing effect. With this we make our bow to the exhibition of 1845, and revisit the open air in the region of the fountains.

FINE ARTS.

The Greek Slave. By Hyam Power.

The statue of the Greek Slave, now exhibiting at Messrs. Graves and Co., in Pall Mall, holds promise of making a new era in revived art. It is by an American artist, hitherto unknown to fame, and is of such excellence as at once to stamp him as a genius of the very highest order. The figure, which is perfectly nude, is represented as standing in the slave market, resting slightly with the right hand upon a post. The other hand, which is connected with the former by a chain, (an incident not historically true,) hangs in the front of the person. The general aspect of the figure is graceful, and life-like, with a not too servile following of the classic models. In detail, its execution is perfectly masterly, the anatomical developement aiming rather at *expression* than mere form. The back and loins, in particular, are of an exquisite roundness and finish, to place them in a rank with the best works of the ancients. The head is a model of classic dignity; the expression of mingled disgust and shame being worthy of the hand of Michael Angelo. The Greek cap and the drapery, which is gathered round the post, are a marvel of execution. If we could venture to be critical about any thing in the entire work, it would be with regard to the left hand, the disposition of which is, perhaps, somewhat artificial. Upon the whole, however, one need have little hesitation in declaring that we have here the finest work of sculpture that has been produced by any artist of the age. We understand that it has been executed for a Mr. Grant, of Devonshire, and therefore sincerely hope that it may remain in the country. We believe that the same artist has, amongst other works, an Eve, which is considered by those who have seen it even to excel the work now described.

THE ATMOSPHERIC PRINCIPLE FOR RAILWAYS.

The Committee of the House of Commons, headed by Viscount Howick, have made a Report, which, both for the interesting facts which it includes, and the importance of the subject in reference to the future prospects of railway undertakings, is deserving of marked attention. The question was one which appears to have excited a warm interest amongst the members of the Committee themselves, who divided four times upon various passages in the Report; Mr. H. Hind having been in two cases the only dissentient, and in a third only associated with two other members against nine.

The recent Report against the Northumberland Atmospheric Railway by the Committee of which Viscount Worsley was the Chairman, would be of a nature to lead some persons to believe that the atmospheric principle was discountenanced by those best able to judge of the matter upon practical grounds. This is an error which we feel it our duty to remove. We have reason to believe that the majority of the Committee in question were strongly impressed with the merits and claims of the atmospheric principle, and that it was only upon the consideration that the proposed Northumberland line was a link in an important chain of railway communication already established, that they were led to their decision of giving the preference to the already established locomotive principle. And even with this consideration to influence their judgment, they were nearly two hours in deliberation before their decision was announced.

This circumstance, connected with the strong Report of the Committee on the atmospheric principle itself, adds considerable weight in its favour; and we candidly declare our belief that the abstract principle of atmospheric propulsion is such as, with the improvement of which it is susceptible, must hereafter to a very great extent supersede the present mode of railway communication. We will not here refer in detail to any of the recent inventions in connexion with this subject; —as the improved communicating medium of Mr. Pilbrow, and the improved exhausting system for the more speedy production of the necessary vacuum, by Mr. Nasmyth; but we cannot help expressing a belief that the promptness with which these improvements have been offered to us, and the fertility of invention which they prove to exist amongst our practical engineers, lead us to anticipate, within a very brief period, the removal of many of the objections which are at present urged against the principle of atmospheric railway communication, particularly as relates to short local traffic, which, in many instances, is of the most important and lucrative character. With these observations, we now proceed to give at length the Report of the Committee on this subject.

REPORT.

YOUR Committee have given their best attention to this interesting subject. Adverting to the great number of railway bills now in progress, they consider that one of the most practical results of this inquiry would be lost if their Report were delayed until after these bills had passed through Committee, and a decision had already been made on their comparative merits.

Your Committee have endeavoured, therefore, to present to the House, with as little delay as is consistent with the due discharge of their duty, the evidence which they have taken, and the opinions to which they have come, and they trust that their labour may not prove altogether useless to the Committees that have to decide on the particular railway schemes now pending.

The House are aware that a railway on the atmospheric principle is already in operation between Kingstown and Dalkey in Ireland.

The first object of your Committee was to make a full inquiry into the result of this experiment. From Mr. Gibbons, Mr. Bergin, and Mr. Vignoles, gentlemen officially connected with the Kingstown and Dublin and Kingstown and Dalkey Railways, they received the fullest and frankest evidence on all the points connected with their management. Your Committee had also the advantage of the opinion of Dr. Robinson, of Armagh, whose scientific knowledge and acquirements render his testimony particularly valuable on the theoretical merits of such an invention.

From this evidence, and from that of Mr. Samuda, it appears that the Dalkey Line has been open for nineteen months, that it has worked with regularity and safety throughout all the vicissitudes of temperature, and that the few interruptions which have occurred have arisen rather from the inexperience of the attendants, than from any material defect of the system.

Your Committee find, moreover, that high velocities have been attained with proportional loads on an incline averaging 1 in 115, within a course in which the power is applied only during one mile and an eighth.

These results have been displayed under circumstances which afford no fair criterion of what may be expected elsewhere; for, in addition to the curves on the line, which would have been considered objectionable, if not impracticable, for locomotive engines, there are alleged to exist defects in the machinery and apparatus, occasioned partly by the difficulties of the situation, partly by mistakes inseparable from a first attempt, which very seriously detract from the efficiency of the power employed, for the remedy of which provision has been made in the experiments now in progress.

These are important facts. They establish the mechanical efficiency of the atmospheric power to convey with regularity, speed, and security, the traffic upon one section of pipe between two termini; and your Committee have since been satisfied, by the evidence of Messrs. Brunel, Cubitt, and Vignoles, that there is no mechanical difficulty which will oppose the working of the same system upon a line of any length. They are further confirmed in this opinion by the conduct of the Dalkey and Kingstown Directors, who have at this moment before Parliament a proposition to extend their atmospheric line to Bray.

In addition to the witnesses already mentioned, your Committee have had the advantage of hearing the objections urged by Messrs. Nicholson, Stephenson, and Locke against the adoption of the atmospheric principle, and the grounds of their preference for the locomotive now in use.

Your Committee must refer the House to the valuable evidence given by these gentlemen. It will be seen that great difference of opinion exists between them and the other witnesses to whom your Committee have before referred, both in their estimation of what has already been effected, and in their calculations of future improvement.

But without entering upon all the controverted points, your Committee have no hesitation in stating, that a single atmospheric line is superior to a double locomotive line both in regularity and safety, inasmuch as it makes collisions impossible, except at crossing-places, and excludes all the danger and irregularity arising from casualties to engines or their tenders. Now the importance of these considerations will be best estimated by a reference to the return of accidents for

15 months, appended to this Report. It will there be seen that there have been during that period 14 collisions upon the road, and 13 accidents to engines, which would altogether have been avoided on the atmospheric system, and that these casualties entailed the loss of 11 lives, as well as the serious injury of 45 persons. From the other 20 accidents, common to both systems, resulted only four deaths, and two persons injured. There is certainly one case in which the engine passed uninjured over cattle lying upon the road, together with its entire train; but then against this security derived from the advantage of weight in surmounting obstacles, must be set the great danger to which the engine-driver and stoker are exposed, standing as they do upon an open platform.

Your Committee desire also to bring to the attention of the House a peculiarity of the atmospheric system which has been adduced by the objectors to prove how unsuited it must be profitably to carry on a small and irregular traffic; namely, that the greatest proportion of the expenses of haulage on the atmospheric principle are constant, and cannot be materially reduced, however small the amount of the traffic may be. This is, no doubt, a serious objection to the economy of the atmospheric system under the circumstances above alluded to. But, on the other hand, as the expenses do not increase in proportion to the frequency of the trains, it is to the interest of the Companies adopting the atmospheric principle to increase the amount of their traffic by running frequent light trains, at low rates of fare; by which the convenience of the public must be greatly promoted. Upon an Atmospheric Railway the moving power is most economically applied, by dividing the weight to be carried into a considerable number of light trains. By locomotive engines, on the contrary, the power is most conveniently applied by concentrating the traffic in a smaller number of heavier trains. The rate of speed at which trains of moderate weight can be conveyed on an atmospheric line, makes comparatively little difference in the cost of conveyance; whilst the cost of moving trains by locomotive engines increases rapidly with the speed.

Now when it is considered that we surrender to great monopolies the regulation of all the arteries of communication throughout the kingdom, that it depends in a great measure upon their view of their interest when we shall travel, at what speed we shall travel, and what we shall pay, it becomes a material consideration, in balancing the advantages ensured to the public by rival systems, to estimate not so much what they respectively can do, but what, in the pursuit of their own emolument, they will do.

The main objections of the opponents of the atmospheric system seem to rest, 1st, on the supposed increased expense of the atmospheric apparatus over and above the saving made in the construction of the road; 2nd, on the inconvenience and irregularity attending upon a single line. With reference to the last point, your Committee felt it their duty to direct their first attention to the question of security, and they have already stated that there is more security in a single atmospheric line than in a double locomotive. They may further observe, that they find the majority of the engineers who have been examined are decidedly of opinion that any ordinary traffic might be carried on with regularity and convenience by a single atmospheric line.

Mr. Brunel has proposed to double the line in those places where trains are intended to meet; and he has further shown that in a hilly country, with long planes of sufficient inclination to allow of the descent of trains by the unaided power of gravity, it might be possible to effect this object without the expense of the tube.

With respect to expense, and to some other contested points, your Committee do not feel themselves competent to report a decided opinion. It would scarcely be possible at the present time to institute a fair comparison of a system which has had 15 years of growth and development, with another which is as yet in its infancy. That comparison would, after all, be very uncertain; it must depend much on details of which we are ignorant; much on scientific knowledge which we do not possess.

There are, however, questions of practical importance, having reference to the present state of the railway bills before the House, to which your Committee consider themselves bound to advert.

There is a doubt raised in the Reports of the Board of Trade, whether the atmospheric system has been sufficiently tested to justify the preference of a line which can only be worked on the atmospheric system, or which presents gradients less favourable than a competing line for the use of the locomotive engine.

If it were practicable to suspend all railway legislation until the result of the Devon and Cornwall, and of the Epsom and Croydon atmospheric lines were known, it would be perhaps the most cautious and prudent course to wait that result; but such a course, independent of all considerations of expediency, is evidently impracticable. Your Committee venture therefore to express their opinion to the House, that in deciding between competing lines of railway, those which have been set out to suit the atmospheric principle ought not to be considered as open to valid objection merely on account of their having gradients too severe for the locomotive, nor should they be tested in comparison with other lines solely by the degree of their suitableness to the use of the locomotive.

No doubt in matters like these experience alone can decide the ultimate result, but your Committee think that there is ample evidence which would justify the adoption of an atmospheric line at the present time. All the witnesses they have examined concur in its mechanical success. Mr. Bidder says, "I consider the mechanical problem as solved, whether the atmosphere could be made an efficient tractive agent. There can be no question about that; and the apparatus worked, as far as I observed it, very well. The only question in my mind was as to the commercial application of it." Mr. Stephenson admits that under certain circumstances of gradients (1315), and under certain circumstances of traffic without reference to gradients (1204), the atmospheric system would be preferable.

While your Committee have thus expressed a strong opinion in favour of the general merits of the atmospheric principle, they feel that experience can alone determine under what circumstances of traffic or of country the preference to either system should be given.

22nd *April*, 1845.

UNITED STATES EXPLORING EXPEDITION.

Narrative of the United States Exploring Expedition during the years 1838—1842, *by* C. Wilkes, U.S.N. 5 vols. Wiley and Putnam.

This is a work of considerable importance, compiled under authority of the government of the United States: its statements may be received as well digested and authentic. The object of the expedition was the noble and useful one of bringing under the notice of the geographer, and the man of research, regions of the earth hitherto little known, if known at all. The result is most interesting; although much yet remains to be done to fulfil the intentions of the projectors of the expedition. Tired as we are with the oft-repeated journals of tourists in the beaten tracks, it is really a pleasure to hail such an accession of information in regard to scenes so fresh and fruitful as those which occur in these volumes. So much as regards their matter; of their manner, we have only to observe that, published in America, they are thoroughly American in style, exhibiting all that high, vaunting, blustering tone to which the rising descendants of Old England are so prone. A few extracts will better serve to exhibit the variety of information, and the liveliness of style of this production, than pages of comment:—

THE ISLAND OF ST. JAGO.

There are many high peaks and mountains in its centre; which afford a fine background for the barren and uninteresting coast scenery. The time of our arrival was just after the rainy season, the island consequently presented a more verdant appearance than it does at other seasons of the year. Our consul, J. Gardiner, Esq., came on board, and made us welcome to all the island afforded. An officer was despatched to call upon his excellency the governor, to report our arrival, who proved to be a black man. Knowing that the regulations required permission for vessels to depart, the request was made during the interview, which he readily granted at any hour we chose. The town of Porto Praya is prettily situated on an elevated piece of table-land, and looked well from the anchorage. The bay is an open one, but is not exposed to the prevailing winds. There is generally a swell setting in, which makes the landing unpleasant and difficult. The only landing-place is a small rock, some distance from the town, and under a high bank, on which there is, or rather was, a fortification, for it is now entirely gone to decay. It commands the bay, and is situated about two hundred feet above the sea. The horizontal stratification of the red and yellow-coloured sandstone shews most conspicuously in this cliff, and forms one of the most remarkable objects on this part of the island. It is of tertiary formation, and contains many fossils. I regretted extremely that my time did not permit me to make a longer stay, as we left the island under the impression that there is much here to be found that is new in the various departments of natural history. Between this bluff and the town is an extensive valley, in which there are many date-palms, cocoa-nuts, and a species of aloe. On landing, a stranger is immediately surrounded by numbers of the inhabitants, with fruit, vegetables, chickens, turkeys, and monkeys, all pressing him with bargains, and willing to take any thing for the purpose of obliging their customers. Many of them continue to follow until they meet with some new customer. The soil, rocks, and every thing around on the surface, show unequivocal marks of volcanic origin. The rock above the tertiary formation is a thick bed of cellular lava, with fragments of the same strewn in every direction over it. A thin and poor soil gives but little sustenance to a light herbage. Goats and asses are found in great numbers grazing upon it. The length of our visit did not permit us to make much examination, yet the character of the vegetation was unequivocally African. The walk from the landing to the town is exceedingly fatiguing, and the road deep with sand. The first view of the town on entering it is any thing but striking, and all the ideas formed in its favour are soon dispelled. The houses are whitewashed, and in general appearance resemble those inhabited by the lower orders in Madeira, but they are much inferior even to them. The north-east of the town is composed of rough stone houses, covered with palm leaves. The streets are wide, and in the centre is a large public square, the middle of which is occupied by a small wooden monument, said to be emblematical of royalty! A chapel, jail, and barracks constitute the principal public buildings. The fort, which flanks the town, is almost entirely in decay. This is the case with almost every thing we saw here: the place is, indeed, little better than an African town. The houses are of stone, one storey high, partly thatched, and others tiled. Their interior presents only a few articles of absolute necessity. Of comfort and cleanliness, in our sense of the words, they have no idea. The houses and streets are filthy in the extreme, and in both of them, pigs, fowls, and monkeys appear to claim, and really possess, equal rights with the occupants and owner. The population is made up of an intermixture of descendants from the Portuguese, natives, and negroes from the adjacent coast. The Negro race seems to predominate, woolly hair, flat noses, and thick lips being most frequently met with. The number of inhabitants in St. Jago is about thirty thousand. Porto Praya contains two thousand three hundred, of which number one hundred are native Portuguese. The language spoken is a jargon formed by a mixture of the Portuguese and Negro dialects. Most of the blacks speak their native tongue. Mr. Hale, our philologist, obtained here a vocabulary of the Mandingo language, and found it to agree with that given by Mungo Park.

PETCHERAI WOMEN.

The women were never suffered to come on board. They appeared modest in the presence of strangers. They never move from a sitting posture, or rather squat, with their knees close together, reaching to their chin, their feet in contact, and touching the lower part of the body. They were extremely ugly. Their hands and feet were small and well-shaped, and from appearance they are not accustomed to do any hard work. They appear very fond and seem careful of their young children, though on several occasions they offered them for sale for a trifle. They have their faces smutted all over, and it was thought, from the hideous appearance of the females, produced in part by their being painted and smutted, that they had been disfigured by the men previous to coming alongside. It was remarked that when one of them saw herself in a looking-glass, she burst into tears, as Jack thought from pure mortification. The men are employed in building the huts, obtaining food, and providing for their other wants. The women were generally seen paddling their canoes. When this party of natives left the ship and reached the shore, the women remained in their canoes, and the men began building their temporary huts; the little children were seen capering quite naked on the beach, although the thermometer was at 40 degrees. On the hut being finished, which occupied about an hour, the women went on shore to take possession of it. They all seemed quite happy and contented. Before they left the ship, the greater part of them were dressed in old clothes, that had been given to them by the officers and men, who all shewed themselves extremely anxious to "make them comfortable." This gave rise to much merriment, as Jack was not disposed to allow any difficulties to interfere in the fitting. If the jackets proved too tight across the shoulders, which they invariably were, a slit down the back effectually remedied the defect. If a pair of trousers was found too small around the waist, the knife was again resorted to, and in some cases a fit was made by severing the legs. The most difficult fit, and the one which afforded the most merriment, was that of a woman to whom an old coat was given. This she concluded belonged to her nether limbs, and no signs, hints, nor shouts could correct her mistake. Her feet we thrust through the sleeves, and after hard squeezing she succeeded in drawing them on. With the skirts brought up in front, she took her seat in the canoe with great satisfaction, amid a roar of laughter from all who saw her.

THE CHILIANS.

The Chilians are extremely fond of the dance called the samacueca. This may be called the national dance, and is in vogue among the common people. It is usually performed at the chingano, which is a kind of amphitheatre, surrounded by apartments where refreshments, including strong drinks, are sold, and is generally well filled with both sexes. The dance is performed on a kind of stage, under an open shed. The music is a mixture of Spanish and Indian, and is performed altogether by females, on an old-fashioned long and narrow harp, one end of which rests on the lap of the performer, and the other on the stage, ten feet off. A second girl is seen merrily beating time on the sounding-board of the instrument. On the right is another, strumming the common chords on a wire-string guitar or kitty, making, at every vibration of the right hand, a full sweep across all the strings, and varying the chords. In addition to this they sang a national love-song, in Spanish, at the top of their voices, one singing a kind of alto; the whole producing a very strange combination of sounds. The dance is performed by a young man and woman; the former is gaudily decked in a light scarlet jacket, embroidered with gold lace, white pantaloons, red sash, and pumps, with a tiny red cap; whilst that of his partner consists of a gaudy painted muslin dress, quite short and stiffly starched, not a little aided by an ample pair of hips; thrown over all is a rich coloured French shawl; these, with well-fitted silk stockings, complete her attire. These last are in true characteristic of the Chilian women of all classes, and they take no pains to conceal them. One not unfrequently sees the extravagance of silk-stockings in the washerwomen at their tubs, and even with their hands in the suds. The dress in general fits neatly, and nature is not distorted by tight lacing, or the wearing of corsets. Nothing is worn on the head, and the hair being parted, and equally divided from the forehead back to the neck, hangs down in two long plaits on each shoulder to the waist. The style of dancing is somewhat like a fandango. The couple begin by facing each other, and flirting handkerchiefs over each other's heads, then approaching, slowly retreating again, then quickly shooting off to one side, passing under arms without touching, with great agility, rattling and beating time with castanets. Their movements are quite graceful, those of their feet pretty, and withal quite amorous; the gestures may be readily understood, not only by the native audience, but by foreigners. I cannot say much for its moral tendency.

GIMBLET FAITH.

This new faith has made some progress among these islands, and has the following singular origin: a native of Savaii, by name Seeovedi, was taken from that island by a whale-ship, and did not return for several years. During his absence he visited several ports, where it would seem he obtained some notions of the forms and ceremonies of the Roman Catholic Church. Possessed of considerable natural shrewdness, he founded on this knowledge a plan to save himself from labour for the future, by collecting followers at whose expense he might be maintained. During his absence, and while on board the whale-ship, he had received, as is usual in such cases, instead of his native name, that of Joe Gimblet; and this cognomen is now firmly attached to the sect of which he was the founder. Having formed the plan of founding a sect, he did not scruple as to the means of carrying it into effect; for he boldly claimed a heavenly mission, professing to hold converse with God, and asserting that he possessed the power of working miracles, raising the dead, &c. He soon gained many proselytes, and had attained great consideration and authority, when, unfortunately for him, he was called upon to exert his pretended power of raising the dead by restoring to life the favourite son of a powerful chief called Lelomiava, who had been murdered. Joe did not hesitate to undertake the accomplishment of this miracle. He in the first place directed a house to be built for the reception of the body, and when it was finished he required that it should be supplied with the best provisions. In conformity with this requisition, the choicest articles of food that could be obtained were regularly handed to Joe for the use of the defunct, upon whom he alone waited, while every other person except the chief and himself was excluded from the building. The food thus regularly supplied as regularly disappeared; and Joe assured the chief that his son had eaten it, and under this bountiful allowance would soon recover his strength and walk forth. In this way time wore on, until the patience of the old chief began to show symptoms of being exhausted. This somewhat alarmed Joe; but as he was a fellow of infinite resources, he contrived to evade inquiry and procrastinate, hoping, no doubt, that some lucky incident might turn up, by which he should be enabled to extricate himself from the dilemma. Unfortunately for him, however, after another month of anxious suspense, the old man's pigs and taro fell short, notwithstanding the chief's dependants had for a long time been restricted from using them. All of them were in fact much reduced by their compulsory fast, with the exception of Joe, whose rotundity of form seemed to indicate that he at least ran no risk of starvation. Whether it were owing to the suspicions which his jolly appearance excited, or that he began to entertain doubts of Joe's supernatural powers, is not known; but one day old Lelomiava determined to satisfy himself of the progress making in the restoration of his son. With this design he entered the house, and was shocked with the sight of his son's body in a state of loathsome putridity. He immediately summoned Joe, and informed him that it was time that the promised miracle should be accomplished, adding, that it must be done by morrow's dawn. Joe immediately redoubled his exertions, and prayed hastily to all the saints of his calendar. He, however, knew full well what would be his fate if he remained to encounter on the morrow the anger of the savage chief. He therefore effected his escape during the night, and made his way to his native island. There he remained for some time incog., but now ventures to appear openly, practising his impositions boldly, and is the worst antagonist the missionaries have to deal with. This story was related by the old chief himself, who, instead of finding his son restored to life, was compelled to bury his body, which he did, with the exception of the head. This he put in a box, and suspended beneath the peak of the roof of his house, where it remains, a witness of his credulity and of the gross imposition that was practised upon him. While the party remained at Siusinga, a sick native was brought from the coast to a neighbouring house, and their host, the Gimblet priest, was called upon to pray for him. This afforded them an opportunity, that might not otherwise have occurred, of learning some facts in relation to the ceremonies of this sect. On this occasion, the priest approached the house where the sick man lay, and when upon the stone platform in front of it, he drew forth a book from the folds of tapa in which it had been carefully enveloped. He then called upon Jehovah, returning thanks for the many blessings which had been conferred on his people, and asked for a continuance of the same, invoking the name of Jesus. He ended by inquiring the divine pleasure concerning the sick man, and begging mercy for him. The nature of the book could not be distinctly seen, as it was again carefully inclosed in the tapa as soon as the ceremony was over; but so far as it was visible, it bore an unquestionable resemblance to a blank note-book! The proselytes of this sect, in case of sickness, confess their sins to one another, and have a number of fast-days, which are rigidly kept. Their Sabbath occurs only once a month, and is celebrated by the firing of guns and the puerile mummery in which their worship consists.

The Miner's Advocate. Newcastle upon Tyne.

We rejoice to see this spirited periodical appear again, " An old friend with a new face." It was during its former career the undaunted advocate of a class of great importance to the community, whose claims to its consideration have been generally neglected. The labourer beneath the bowels of the earth, by his unwearied activity and constant energy, accumulates wealth, not for himself, but for the careless and often improvident proprietor of the soil. He is exposed to hardships, to dangers which those who labour in the open fields fortunately escape, and most certainly ought he to be defended against the evils which arise out of the neglect of those for whose benefit he toils. This journal, published on the spot where coal mines abound, has been fearlessly conducted, has been most useful, and promises to maintain its salutary career.

SCIENTIFIC MEMORANDA.

By John Joseph Lake.

I. REMARKABLE APPEARANCE OF FLIES AT BELFAST.

During the summer of 1842, the first I spent in Ireland, there were several periods of very hot dry weather. On one of these occasions, in the beginning of June, when the air was very calm, I observed over the tops of the trees an appearance as of ascending smoke, which, on close examination, I found to arise from a multitude of flies hovering over them, not in a mass, but in the form of ascending columns, undulating from the gentle motion of the air.

The above was not merely visible on the tops of a few trees, but over every tree that I saw during a short walk out of the town. A gentleman informed me the following morning that he saw the same thing on the road between Carrickfergus and Belfast, and that it also appeared on the top of every hill along that road. I cannot say positively that I observed this myself; but I noticed what appeared to be a brown mist hanging upon Divis and the Black Mountain. Not conceiving that there could be such a collection of insects as would be visible on these points, the latter of which was about two miles and three quarters distant from the spot whence I saw it, and the former twelve miles, I paid no particular attention to it, which I have since regretted; and not being an entomologist, I neglected to find out what sort of flies they were that had congregated together in such myriads.

Many of the common people in the neighbourhood who witnessed the rebellion of 1798, and who are, or pretend to be[a], very superstitious, seemed oppressed with gloom on account of this appearance; for they said it was the fairies dancing, and that the like had not been seen since the summer before the rebellion; and they appeared to regard it as an omen of a similar calamity, which apprehension the state of the country at the time seemed in some measure to justify.

A similar gathering of flies was observed in the summer of 1843, but to a less extent.

II. APPEARANCE OF PRISMATIC COLOURS BETWEEN THE SUN AND THE OBSERVER, AT BELFAST.

The rainbow is generally, if not always, seen in that part of the sky which is opposite to the sun. I am not aware of any instances upon record where it appeared in any other way, though it has been seen in various forms as distorted and inverted bows, red bows have also been seen, and an unusual number have sometimes been visible at once.

In the Polytechnic Review[b], is recorded a mist bow, observed at Belfast. I have seen this quite perfect, with the colours more distinct than formerly, during the past winter.

On the morning of Good Friday, the 21st of March last, at twenty minutes after six, A.M., having occasion to be up through a member of my family being unwell, I perceived three colours of the spectrum considerably to the southward, but between me and the sun. They were in the form of a vertical band between two banks of cloud through which the latter appeared. Red was nearest to the sun, next orange, and lastly, yellow. The appearance was produced by vapour beyond the clouds, for the dark streaks that passed across the sun also crossed the band of colours, concealing both as far as they extended. The openings in the clouds through which the sun and coloured band appeared, disclosed a very watery atmosphere beyond them, that reduced the light of the sun to a dull gold colour. The day turned out very wet. As the sun arose the coloured band gradually disappeared, becoming invisible first at the part next to the horizon. Twenty minutes elapsed from the time I first noticed it until its disappearance. I should have attributed it to the vapours from the Castlereagh hills that produced the false moon on the 12th of July, 1843[a], but the dark streaks passing across and hiding the colours proved that it resulted from vapours beyond the clouds in the horizon.

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[a] The lower orders in Ireland do not always confine themselves strictly to truth when conversing with strangers on their superstitions, antiquities, &c. Many of them retail stories on these subjects which it requires little discrimination to see are their own invention. They also will frequently pretend to believe things that they have no faith in, and to be ignorant where they are very well informed; so that a stranger should be careful in retailing as genuine what he hears casually by the way. I might instance the story of "Tim's Pipes" and the fairies in Kohl's "Ireland" as an instance of this practice, where it is clear the narrator did not believe a word of what he was telling the author. This prevails most in the south and west, where they have more wit and vivacity than in the north.

[b] Vol. I. New Series, p. 81.

THE PRODUCTION OF EARTHQUAKES BY THE ELECTRIC FLUID.

Those of the readers of the Polytechnic Review who have been interested in an article which appeared lately in it under the above title, will doubtless have noticed an account of the "effects of earthquakes on clocks in Granada," recorded in the part for February last, page 157.

If any thing was wanting in that paper to confirm the theory of the electric origin of these catastrophes, it was magnetic observations during their occurrence. I was, indeed, anxious to procure such, to add to the evidence therein adduced, but had no success. The paragraph in question has, however, afforded it; for the revolution of the compasses on their pivots in the Thames steamers at the time of the shock, could only have resulted from electricity, which confirms the truth of the theory even more than Dr. Zusso's experiment.

Since the publication of my article alluded to above, I have also fallen upon another remarkable fact in connexion with the subject, namely, the occurrence of lightning during an earthquake. It is recorded in Dr. Howell's History of England, page 121, (a curious little work, published in the reign of Charles II.,) to have happened in the reign of William II.: the lightning is described as being "vehement," and "leaving an intolerable stink behind it."

These incidents render the testimony in favour of the electric origin of earthquakes most complete; the first showing the fluid actually in motion by its magnetic effects; the second showing it simultaneously in motion in the atmosphere and in the soil, accounting for the noises in the air as well as in the ground which attend these phenomena.

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[a] Vol. I. New Series, p. 81.

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